



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

SEP 01 2016

REPLY TO THE ATTENTION OF:

Peter Ostlund, Acting Chief
Water Resources Division
Michigan Department of Environmental Quality
Constitution Hall
525 West Allegan Street
Post Office Box 30473
Lansing, Michigan 48909-7973

Re: 40 Code of Federal Regulations (C.F.R.) § 761.61(c) April 6, 2016 Application for the Remediation of PCB Contaminated Sediment within Zones 3 and 4 of Operable Unit 1 (OU1), Manistique River Great Lakes Area of Concern (AOC) Project; 453 South Mackinac Avenue, Manistique, Schoolcraft County, Michigan

Dear Mr. Ostlund:

The U.S. Environmental Protection Agency hereby grants approval to the Michigan Department of Environmental Quality (MDEQ) for the remediation of Polychlorinated Biphenyl (PCB) contaminated sediment within zones 3 and 4 of Operable Unit 1 (OU1) at the Manistique River Great Lakes Area of Concern (AOC). Per the April 2016 Operable Unit 1 Final Design Report completed by State contractor Arcadis, you will remove sediment containing greater than 1 part per million (ppm) PCB from Zones 3 and 4 in OU1, with the exception of the northeastern corner of Zone 3. The dredging, conducted in compliance with the final design report, will not pose an unreasonable risk of injury to human health or the environment.

The exception to this dredging plan is in the northeastern corner of Zone 3 (sample location ST10U), where there is a greater than 50 ppm PCB contaminated sediment deposit 7 feet below ground surface (bgs). This deposit represents 3.3% of the material in Zone 3. The steep banks and the proximity of the shoreline to the sample location make removal to 7 feet infeasible without the risk of slope and bank failure. There is a minimum of 3 feet of clean (i.e., less than 1 ppm PCB) material directly above the PCB contaminated sample at 4 to 7 feet bgs. You will perform limited removal in this area by taking out 2 feet of sediment from the surface to 2 feet bgs. This sediment layer has a maximum PCB concentration of 3.8 ppm. You will backfill the area with one foot of clean fill material. EPA agrees with your plan for the management of this greater than 50 ppm material in place.

In order to remove the beneficial use impairments in this area of the Manistique River AOC, you plan to attain a 0.2 ppm PCB surface weighted average concentration (SWAC) across OU1 and a SWAC of 1 ppm within each dredge management unit (DMU). OU1 consists of zones 2, 3, and 4. Zone 2 is a zone of transport and not an area of PCB accumulation, whereas Zones 3 and 4 are areas of PCB accumulation. You calculated the 0.2 ppm PCB SWAC goal across zones 2, 3 and 4. Your Feasibility Study determined that the 0.2 ppm PCB SWAC concentration across OU1 will be achieved by attaining a PCB SWAC concentration of 1 ppm or less within each DMU of Zones 3 and 4 (EA Engineering, Science, and Technology, Inc. and Foth Infrastructure and Environment, LLC. 2013. Part One Feasibility Study for

Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County, Michigan. June 2013). Therefore, you will not perform additional remediation if the SWAC is less than 1 ppm PCB in a DMU post dredging. If the confirmation sampling performed during the dredging shows that the SWAC is greater than 1 ppm PCB within a DMU, you will conduct up to two additional dredge passes where feasible (e.g., no bedrock or soft sediment greater than 6 inches thick is in the area), with confirmation sampling performed after each dredge pass. If the SWAC remains greater than 1 ppm PCB after the second or third dredge pass, you will place a clean sand cover over that area. If, after additional dredging, the SWAC achieves 1 ppm PCB, placement of clean sand cover is not required.


This approval is granted in accordance with the federal PCB regulations codified at 40 C.F.R. § 761.61(c), under which the EPA Regional Administrator may approve a method to sample, cleanup, or dispose of PCB remediation waste if it is found that the method will not pose an unreasonable risk of injury to human health or the environment. The authority to grant such approvals in this Regional office has been delegated to the Director of Land and Chemicals Division.

This approval is effective as of the date of this letter. All cleanup and disposal activities must be carried out in accordance with the April 2016 Operable Unit 1 Final Design Report. The dredged sediments must be transported to a hazardous waste landfill permitted by EPA under section 3004 of the Resource Conservation and Recovery Act (RCRA), or by a State authorized under section 3006 of RCRA or a Subtitle D Solid waste facility, whose permit allows it to accept PCB, based on the in-situ PCB concentration. When you complete the project and dismantle the access roads, you must sample the material on and under the roads for PCBs to a depth of 6 inches. You must remove and dispose to a landfill permitted to receive any portion of the material on or under the road that has PCBs in excess of 1 ppm. After the remedy is implemented, you must submit a copy of the construction completion report to EPA.

MDEQ is responsible for ensuring continued compliance with all applicable provisions of the Toxic Substances Control Act, the federal PCB regulations, and the conditions of this approval. Any departure from the conditions of this approval must receive prior written authorization from this office. Furthermore, this approval does not relieve MDEQ from compliance with any other federal, State, or local regulatory requirements, and does not preclude EPA from initiating any enforcement action, including an action seeking civil penalties, for any violation.

If you have any questions regarding this approval, please contact me or Jean Greensley, of my staff, at (312) 353-1171 or greensley.jean@epa.gov.

Sincerely,

M. G.
 Michael D. Harris

Margaret M. Guerriero
Director
Land and Chemicals Division

cc: Michael Alexander, MDEQ (email)
Alyssa Riley, MDEQ (email)
Deb MacKenzie-Taylor, MDEQ (email)



RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING



KEITH CREAGH
DIRECTOR

April 6, 2016

VIA E-MAIL

Mr. Peter Ramanauskas
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard (LU-9J)
Chicago, Illinois 60604-3507

Dear Mr. Ramanauskas:

SUBJECT: Application for Risk-Based Disposal Approval in Accordance with Title 40 of the Code of Federal Regulations (CFR), Section 761.61, PCB Remediation Waste, for the Remediation of Contaminated Sediment within the Manistique River Great Lakes Area of Concern (AOC) Project; 453 South Mackinac Avenue, Manistique, Schoolcraft County, Michigan

The Michigan Department of Environmental Quality (MDEQ) is requesting, Toxic Substance Control Act of 1976 approval for the "Operable Unit 1: Final Design Report" in accordance with the requirements of 40 CFR, Section 761.61(c), for the remediation of PCB-contaminated sediment within the Manistique River Great Lakes AOC.

In accordance with 40 CFR, Section 761.61(a), the following information has been submitted electronically via our contractor's (Arcadis) FTP site:

- Operable Unit 1: Final Design Report
- Appendices to Final Design Report
- Figures to Final Design Report
- Part One Feasibility Study for Operable Unit 1
- Part Two Feasibility Study for Operable Unit 1
- Conceptual Site Model for the Manistique River AOC

The MDEQ appreciates the guidance and assistance provided by the United States Environmental Protection Agency (USEPA), Region 5, Toxic Substances Control Act Program. I look forward to receiving written agency approval of our application as soon as possible. Should you require additional information, please contact Mr. Michael Alexander, Chief, Lakes Erie, Huron, and Superior Unit, Water Resources Division, at alexanderm2@michigan.gov; 517-449-7971; or MDEQ, P.O. Box 30458, Lansing, Michigan 48909-7958.

Sincerely,

Peter Ostlund, Acting Chief
Water Resources Division
517-284-5470

cc: Ms. Jean Greensley, USEPA
Mr. Michael Alexander, MDEQ
Ms. Deborah MacKenzie-Taylor, MDEQ

State of Michigan Department of Technology, Management and Budget

Operable Unit 1: Final Design Report

Manistique River Area of Concern
Schoolcraft County, Michigan

File No.: 761/14001.SAR

Index No.: 60733

Contract No.: Y14047

April 2016

A large, solid orange geometric shape, resembling a stylized triangle or a section of a larger triangle, is positioned in the bottom right corner of the page. It is composed of two overlapping triangles, creating a complex, angular form. A thin white line runs diagonally through the shape, and a thin white horizontal line runs across the page, intersecting the shape.

CONTENTS

1	Introduction	1
1.1	Site Description	1
1.2	Remedial Action Objectives and Goals	2
1.2.1	Remedial Action Objectives	2
1.2.2	Sediment Cleanup Goals	2
1.3	Summary of Pre-Design Investigations	2
1.4	Description of Selected Remedy	4
1.5	Report Organization	4
2	Pre-Remediation Activities	6
2.1	Procurement of a Remedial Contractor	6
2.2	Preparation of Pre-Mobilization Submittals	6
2.3	Regulations and Permitting	7
2.4	Property Access	10
3	Mobilization	11
3.1	Site Mobilization	11
3.2	Pre-Construction Survey and Sampling	11
4	Upland Support Area Design	13
4.1	Project Requirements and Design Approach	13
4.1.1	Site Preparation	13
4.1.2	Utility Clearance	14
4.1.3	Staging Areas and Haul Roads	14
4.1.4	Off-Loading Area	14
4.1.5	Site Control	14
4.1.6	Traffic Control	15
4.1.7	Upland Restoration	15
5	Sediment Removal	16
5.1	Design Criteria	16
5.2	Design Approach	16
5.2.1	Removal Area Delineation	16

Operable Unit 1: Final Design Report

5.2.1.1	General Removal	16
5.2.1.1	TSCA Removal Area Delineation	17
5.2.2	Geotechnical Considerations	19
5.2.3	Remedial Action Design Components	20
5.2.3.1	Resuspension Controls.....	20
5.2.3.2	Debris Removal	21
5.2.3.3	Sediment Dredging	22
5.2.3.4	Water Quality Monitoring	23
5.2.3.5	Residuals Management Plan.....	23
5.2.3.6	Cover Placement	24
5.2.3.7	Restoration.....	24
6	Sediment Dewatering and Wastewater Treatment	25
6.1	Design Criteria.....	25
6.1.1	Sediment Properties.....	25
6.1.2	Influent Characteristics	25
6.1.3	Discharge Limits.....	26
6.1.4	Wastewater Flow Rates	27
6.2	Design Approach.....	28
6.2.1	Sediment Dewatering.....	28
6.2.2	Wastewater Treatment.....	29
6.2.3	Influent and Effluent Monitoring	29
7	Waste Management	30
8	Project Close-out and Demobilization.....	31
8.1	Decontamination	31
8.2	Post-Construction Survey and Sampling	31
8.3	Demobilization	31
9	Post-Remedial Action Activities	32
9.1	Construction Completion Report	32
9.2	Post-Remediation Monitoring Activities.....	32
9.3	Institutional Control.....	32
10	Construction Schedule and Sequencing.....	33

11 References.....	34
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TABLES

Table 1 Required Permits for OU1 Remediation to be Obtained by Arcadis

Table 2 Required Permits for OU1 Remediation to be Obtained by Contractor

Table 3 Sediment Samples with PCB Results Greater than 50 mg/kg

Table 4 Preliminary Wastewater Pre-Treatment Requirements

FIGURES

Figure 1 Site Location Map

Figure 2 Site Layout

Figure 3 Conceptual Process Flow Diagram

Figure 4 Sample Location Map and Removal Areas – Zone 3

Figure 5 Sample Location Map and Removal Areas – Zone 4

Figure 6 Sample Location Map and Dredge Depth Limits– Zone 3

Figure 7 Sample Location Map and Dredge Depth Limits– Zone 4

Figure 8 Residuals Management Plan Decision Making Flow Chart

APPENDICES

Appendix A 2015 Pre-Design Investigation Data

Appendix B Technical Specifications

Operable Unit 1: Final Design Report

Appendix C Contract Drawings

Appendix D Dredging Slope Stability Calculations

Appendix E Woody Debris Mapping

1 INTRODUCTION

Arcadis of Michigan, LLC (Arcadis) has prepared this Final Design Report on behalf of the State of Michigan Department of Technology, Management, and Budget (DTMB) and the Michigan Department of Environmental Quality (MDEQ) to present the final design for Operable Unit 1 (OU1; Zones 2, 3, and 4) remediation activities at the Manistique River Area of Concern (AOC; Site) located in Manistique, Michigan.

This Final Design Report provides information on the following:

- design criteria
- basis of design documentation
- final drawings and specifications
- project schedule

1.1 Site Description

The Site is an approximate 1.7 mile stretch of the Manistique River that extends from the dam in the City of Manistique (city) to the mouth of the Harbor at Lake Michigan located in Michigan's Upper Peninsula in Schoolcraft County, Michigan (Figure 1). The Site is divided into seven zones numbered Zone 1 through Zone 7. This report presents the final design for OU1, which is comprised of Zones 2, 3 and 4 as shown on Figure 2. Zones 1, 5, 6, and 7 are outside of OU1 and therefore outside of the scope of the OU1 remedy. As directed by the project partners (MDEQ, United States Environmental Protection Agency [EPA], and National Oceanic and Atmospheric Administration [NOAA]), OU1 remedial activities will only occur within Zones 3 and 4; therefore the remainder of this document focuses solely on those zones.

The primary uses of Zones 3 and 4 are recreational, including boating, sightseeing, and fishing. Zone 3 consists of a pair of bays, referred to as North Bay and West Bay. North Bay ranges from 100 to 200 feet (ft) wide and is approximately 500 ft long. Water depths range from shallow at the northern border of the bay to 9-10 ft in its center channel. The North Bay is hydraulically connected to a drainage ditch that runs east of the former Manistique Papers Company buildings. West Bay is approximately 75 ft wide and 500 ft long, including the bend. Both bays abut the industrial areas to the north. West Bay abuts a small forested area, and Route 2 crosses over the mouth of North Bay.

Zone 4 consists of a 150-ft-wide, 500-ft-long bay that is currently used as a private marina. The marina is shallow, with typical water depths of 4-5 ft. Zone 4 is connected to Zone 3 through a culvert under Route 2 just south of the bend in West Bay. Zone 4 is bordered by Route 2 to the north and by forested or open ground with associated commercial properties to the west and east (EA and Foth, 2013a).

The substrate of the river bottom consists of naturally deposited materials and woody debris material overlying limestone bedrock. Woody material is abundant in the sediment and takes numerous forms, including deposits of unconsolidated fine particles, sawdust, wood chips, boards, and small branches (CH2M HILL, 2012). Zone 3 contains a wide variety of substrate types, ranging from areas containing a high percentage of gravel and sand in the northern portion of North Bay to finer-grained silts and clays in West Bay and near the connection to the river. Zone 3 contains areas dominated by larger woody debris. Zone 4 is characterized by a mix of silt and sand combined with fine-grained woody debris. (EA and Foth, 2013a).

1.2 Remedial Action Objectives and Goals

1.2.1 Remedial Action Objectives

As described in the Part Two Feasibility Study for OU1 (EA and Foth, 2013c, [FS]), the overall Remedial Action Objective (RAO) for the Site is to remove the Site Beneficial Use Impairments (BUIs). The only BUI applicable to OU1 is the removal of the restriction on fish consumption. The elevated concentrations of polychlorinated biphenyls (PCBs) in fish, which affect fish consumption advisories, are believed to be largely derived from sediments containing PCBs.

1.2.2 Sediment Cleanup Goals

Evaluation in the FS identified 0.2 mg/kg polychlorinated biphenyls (PCBs) as the surface weighted average concentration (SWAC)-based cleanup goal that would result in the removal of the fish consumption BUI. Spatial modeling predicts that a preliminary remedial action level (PRAL) of 1.0 mg/kg PCBs in sediment, applied as a target for remedial action, is likely to achieve this goal (EA and Foth, 2013b) and ultimately result in the removal of the fish consumption BUI.

1.3 Summary of Pre-Design Investigations

Investigations have been ongoing within the Site since the remedial actions completed between 1993 and 2000. These investigations include:

- Surface sediment sampling conducted by EPA, NOAA, and/or United States Army Corps of Engineers (USACE) in 2002, 2004, 2005, 2006, 2007, 2008, 2010, and 2011 which included collection of samples for PCB Aroclor analysis;
- Subsurface sediment sampling conducted by EPA, NOAA, and/or USACE in 2001, 2010, 2011, and 2012 which included collection of samples for PCB Aroclor analysis;

Operable Unit 1: Final Design Report

- Collection of fish tissue PCB data in 2004 and 2008 by MDEQ`;
- *Lumbriculus* bioaccumulation data collected in 2011 by EPA;
- Riparian spider bioaccumulation data collected in 2012 by United States Geological Survey (USGS);
- Hydrodynamic modeling completed in 2012 by NOAA;
- Pore water, passive sampler, and benthic bioaccumulation data collected in 2012 by EPA, Great Lakes National Program Office (GLNPO), and MDEQ; and
- Groundwater-surface water interaction studies completed in 2012 by EPA, GLNPO, and MDEQ.

Many of these investigations are summarized in the historical document review prepared by CH2M Hill (CH2M Hill, 2012). Additional sampling was completed to support development of the conceptual site model (CSM; EA and Foth, 2013a). These investigations included:

- Waste characterization, geotechnical characterization, amendment testing, geotube dewatering testing, and an ice scour and propeller wash survey completed in 2012; and
- Sediment and age core sampling conducted in 2013.

A final pre-design investigation (PDI) was conducted in October 2015 to satisfy data gaps needed to complete the design for OU1 (Arcadis, 2015). This work included the following:

- Completion of hydrographic surveys, including bathymetric, magnetometer, side-scan sonar, and sub-bottom profile surveys;
- Shoreline reconnaissance to identify shoreline conditions including critical structures, armoring, and other waterfront features;
- Field reconnaissance and probing to locate utilities, identify areas of debris, and determine bedrock elevations;
- Sediment coring to collect bulk sediment samples for treatability testing; and
- Installation of geotechnical borings to evaluate shoreline stability and collect samples for geotechnical analysis.

Data collected during the 2015 PDI are included in Appendix A.

1.4 Description of Selected Remedy

The remedy selected by the project partners for OU1 consists of the following components:

- Removal and disposal of sediment with PCB concentrations greater than 1.0 mg/kg;
- Placement of a sand cover over sediments with residual PCBs greater than 1.0 mg/kg per the residuals management plan; and
- Listing Site in MiWaters database as an institutional control.

Figure 3 presents a conceptual process flow diagram of how the remedial construction activities will be implemented in OU1.

1.5 Report Organization

This Final Design Report is organized as follows:

- Section 1 – Presents the purpose of this Final Design Report, relevant background information, summary of Site history, previous investigations, summary of the selected remedy, and report organization.
- Section 2 – Describes the activities to be completed prior to the implementation of remedial activities.
- Section 3 – Describes the mobilization activities to be conducted.
- Section 4 – Describes the design elements associated with the upland support areas.
- Section 5 – Describes the design elements associated with sediment removal activities.
- Section 6 – Describes the design elements associated with sediment dewatering and water treatment activities.
- Section 7 – Describes the waste management activities.
- Section 8 – Describes the demobilization activities to be conducted.
- Section 9 – Describes the activities to be completed after implementation of the remedial activities.
- Section 10 – Presents the anticipated project schedule.

Operable Unit 1: Final Design Report

- Section 11 – Lists sources consulted as references.

2 PRE-REMEDIAL ACTIVITIES

This section identifies the activities and procedures to be implemented prior to the initiation of remedial activities. Such activities include, but are not limited, the following:

- Procurement of a Remedial Contractor (Contractor).
- Preparation of pre-mobilization submittals.
- Regulations and permitting.

2.1 Procurement of a Remedial Contractor

Following the approval of this Final Design Report, Arcadis will submit a final copy of the bidding documents to DTMB for solicitation of bids for the performance of remedial activities. The bid documents will detail the remedial activities and will include the final construction drawings, specifications, construction schedule, and Contractor bidding documents. The bid documents will be provided to DTMB for posting on the Buy4Michigan website that is used for public bidding. Bids will be received, reviewed, and tabulated by DTMB. It is assumed that DTMB will be responsible for notifying the selected Contractor and entering into the formal agreement with the selected Contractor. The project technical specifications and the design drawings are included in Appendices B and C, respectively.

2.2 Preparation of Pre-Mobilization Submittals

Prior to the start of remedial activities, a number of submittals will be prepared by Arcadis and/or the selected Contractor. The submittals will be prepared to document health and safety procedures to be implemented at the site, the Contractor's understanding of the project scope and the objective of the design, among others. The major submittals to be prepared will include, but not be limited to, the following:

- Operations Monitoring and Maintenance (OM&M) Plan – Arcadis will prepare an OM&M Plan to address monitoring and maintenance that will be conducted during remedial activities. The OM&M Plan will also document post-construction site control plans.
- Construction Quality Assurance Plan (CQAP) – Arcadis will prepare a CQAP to document the quality assurance/quality control (QA/QC) requirements to be implemented during remedial

Operable Unit 1: Final Design Report

activities. The CQAP will describe project communication, documentation, and record-keeping protocols.

- Health and Safety Plan (HASP) –The Contractor will be responsible for implementation of the health and safety program at the Site and will prepare a site-specific HASP to be used by their employees, subcontractors, and other persons with an interest at or near the Site during remedial activities. The HASP will be prepared in accordance with all applicable rules and regulations, including 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926.
- Operations Plan – The Contractor's Operations Plan is required to present the Contractor's detailed approach for implementing the required work activities. The Operations Plan will include the Contractor's Soil Erosion and Sedimentation Control (SESC) Implementation Plan either as an appendix or separate submittal.
- Contingency Plan - The Contractor's Contingency Plan will detail (at a minimum) the following procedures for emergency preparedness and contingencies: spill prevention and spill response; emergency access/egress; emergency evacuation of personnel from the work site; and methods to contain gasoline/diesel fuel or hydraulic oil spills. In addition, the Contingency Plan will include a listing of all contact personnel and emergency phone numbers.

Additional required submittals are identified in the specifications included as Appendix B.

2.3 Regulations and Permitting

Remediation activities at the Site will affect several natural resources and will require compliance with several federal, state, and local regulations. The regulations and requirements for compliance were identified and presented in the OU1 FS, Part 1 (EA and Foth, 2013b). The requirements for compliance with the applicable regulations are summarized below.

Federal Requirements

- Clean Water Act
 - Obtain Section 401 Water Quality Certification
 - Obtain Section 404 Permit

Operable Unit 1: Final Design Report

- Rivers and Harbors Act
 - Obtain Section 10 Permit
- Bald Eagle Protection Act
 - Coordinate with United States Fish and Wildlife Service (USFWS) and Michigan Department of Natural Resources (MDNR); will be addressed in the Environmental Assessment
- Migratory Bird Treaty Act
 - Coordinate with USFWS and MDNR; will be addressed in the Environmental Assessment
- National Historic Preservation Act
 - Consult with the State Historic Preservation Office and Tribal Historic Preservation Office; will be addressed in the Environmental Assessment
- National Environmental Policy Act
 - Prepare Environmental Assessment
- Toxic Substances Control Act (TSCA), PCB Disposal, 40 CFR 761
- Resource Conservation and Recovery Act (40 CFR 257-258, 260-270)

State Requirements

- Natural Resources and Environmental Protection Act
 - Obtain Part 303, Wetlands Permit
 - Obtain Part 323, Shorelands Protection and Management Permit
 - Obtain Part 325, Great Lakes Submerged Logs Recovery Permit
 - Obtain Part 327, Great Lakes Preservation Water Withdrawal permit
 - Obtain Part 111, Hazardous Waste Management Permit

Operable Unit 1: Final Design Report

- Obtain Part 115, Solid Waste Management Permit
- Obtain Part 91, SESC Plan Approval – State may delegate this to the local municipality
- State of Michigan Industrial Stormwater Permit
- A National Pollutant Discharge Elimination System (NPDES) Permit has a processing time of approximately 180 days, which is outside of the timeframe available to complete the OU1 remedy, therefore, any water treatment design provided by the Contractor will need to be performed in a manner that does not require a NPDES permit.

Local Requirements

- Wastewater Discharge Contract

Table 1 and Table 2 summarize the permits that will be obtained to meet the requirements listed above, as well as the timelines and fees associated with each permit.

Table 1 – Required Permits for OU1 Remediation to be Obtained by Arcadis

Required Permit	Timeline	Requirement Satisfied
Joint Permit Application	Processing time of 75-120 days	<ul style="list-style-type: none">- Clean Water Act Section 404 Permit- Section 401 Water Quality Certification- Rivers and Harbors Act Section 10 Permit- Part 303 - Wetlands Permit- Part 323 - Shorelands Protection and Management Permit- Part 325 - Great Lakes Submerged Logs Recovery Permit- Part 327 - Great Lakes Preservation Water Withdrawal Permit
TSCA, PCB Disposal, 40 Code of Federal Regulations 761	NA	<ul style="list-style-type: none">- Will adhere to regulations regarding cleanup and disposal of PCBs. A TSCA determination will be performed.
Resource Conservation and Recovery Act (40 Code of Federal Regulations 257-258, 260-270)	NA	<ul style="list-style-type: none">- Will adhere to the regulations regarding the management of hazardous and non-hazardous solid waste.
Part 111 - Hazardous Waste Management Permit	Site ID numbers issued once completed form and fee received	<ul style="list-style-type: none">- Natural Resources Environmental Protection Act (NREPA) Part 91
National Historical Preservation Act	30 days	<ul style="list-style-type: none">- National Historical Preservation Act
Environmental Assessment – Finding Of No Significant Impact (FONSI)	NA	<ul style="list-style-type: none">- National Environmental Policy Act- Bald Eagle Protection Act- Migratory Bird Protection Act

Table 2 – Required Permits for OU1 Remediation to be Obtained by the Contractor

Required Permit	Timeline	Requirement Satisfied
Soil Erosion and Sedimentation Control Plan Approval	Assumes 60 days	- NREPA Part 91
Wastewater Discharge Contract	Assumes 30 days	- Contract with the City of Manistique to discharge water to the City Water Treatment Plant.
State of Michigan Industrial Stormwater Permit	Assumes 60 days	- State of Michigan Industrial Stormwater Permit

2.4 Property Access

Property access is necessary to facilitate off-loading of material (as necessary), sediment staging, dewatering, processing and water treatment. Areas available to the Contractor for such activities are shown on Drawing 2 (Appendix C). Additionally, there is a marina in Zone 4 within the area that remediation will take place.

The main upland area requiring property access is the area immediately adjacent to Zone 3, just south of the former Manistique Papers Company property. An initial verbal agreement for property access has been granted and Arcadis will continue to coordinate with the property owner to obtain a final executed property access agreement. This property may be used for sediment staging, dewatering, processing and water treatment. The Contractor will also use the area for project facilities and equipment decontamination.

Additionally, a verbal agreement for access has been granted by the owner of the private marina in Zone 4. The property owner will remove all docks within Zone 4 prior to removal activities (if requested); 5 days' notice must be given to the property owner prior to the initiation of activities in order to allow adequate time for dock removal. A final signed access agreement will be obtained prior to initiation of construction activities.

3 MOBILIZATION

This section provides information regarding Site mobilization activities.

3.1 Site Mobilization

The Contractor will mobilize to the Site following the final execution of the formal contract with DTMB. The Contractor will be required to submit all pre-remediation submittals as described in Section 2.2 and the Specifications provided in Appendix B. The Contractor will be responsible for the following general activities and others included in the Specifications:

- Mobilizing manpower, equipment, services, and materials to the site, as necessary, to implement the remedial activities. Equipment mobilized to the Site will be subject to a visual inspection by the Engineer. Equipment that arrives at the Site in unsatisfactory condition (e.g., soiled, poor operating condition), shall be removed from the Site and replaced by the Contractor.
- Mobilizing and establishing a field office trailer to be utilized by the Contractor, Engineer, and the project partners during implementation of the remedial activities.
- Coordinating with local utility companies and the Engineer to obtain access to electrical service, as necessary. In the event that on-Site electrical service is not available or accessible, the Contractor shall be responsible for providing electrical service, as necessary, for use during the remedial activities.
- Provide and maintain portable sanitary services for use by all on-Site personnel engaged in the remedial action.

3.2 Pre-Construction Survey and Sampling

The Contractor will conduct a pre-construction survey to document existing conditions at the upland staging/support areas and access roads. The survey will be used to document the existing grades in areas that will be used for the upland staging/support areas and access roads, document existing utilities, and document any additional significant Site features that may be disturbed during remedial activities. During the survey activities, the Contractor will also take photographs to document the pre-construction conditions. The Contractor will also perform pre-construction sampling of the area to be used for the sediment staging and processing area to document pre-construction conditions. Samples will be collected as described in the Specifications (Appendix B) and will be analyzed for PCBs, volatile organic

Operable Unit 1: Final Design Report

compounds (VOCs), semi-volatile organic compounds (SVOCs), target analyte list (TAL) metals and mercury, pesticides, dioxins and furans. Final required sampling may change pending the receipt of final property access agreements.

The bathymetric survey (Appendix A) conducted in October 2015 as part of the PDI activities will serve as the pre-construction survey for Zones 3 and 4.

4 UPLAND SUPPORT AREA DESIGN

This section presents information regarding upland support area design criteria for remedial activities in OU1. The project requirements for upland support area and layout are primarily defined by the space required for staging dredged sediment, sand cover materials, water treatment, construction equipment, and associated construction materials. Locations available for use for upland support areas are shown on Drawing 2 (Appendix C). A typical Site layout is shown on Drawing 3A (Appendix C). The following elements are included in the upland support area design:

- Site Preparation;
- Utility Clearance;
- Staging Areas and Haul Roads;
- Off-Loading Area;
- Site Control;
- Traffic Control; and
- Upland Restoration.

4.1 Project Requirements and Design Approach

4.1.1 Site Preparation

Prior to initiating construction activities at the site, upland erosion and sedimentation controls will be installed to limit material from moving from the upland areas into the river. Details regarding the erosion and sediment control measures will be provided on the Contract Drawings and in the OM&M Plan. Following the installation of erosion and sedimentation controls, the Contractor will be required to clear vegetation from the areas to be utilized to construct staging areas and haul roads.

A SESC Implementation Plan will be prepared by the Contractor as part of their Operations Plan with specific requirements to address erosion control and stormwater management throughout the construction activities, including requirements for periodic inspection and documentation.

4.1.2 Utility Clearance

The Contractor will contact the appropriate utility-locating agency (i.e., MISS DIG) prior to initiating intrusive activities. The Contractor will be responsible for identifying, relocating, protecting, or abandoning both aboveground and underground utilities (as required and in consultation with MDEQ, the Engineer, and the appropriate utility company/municipality) to facilitate the remedial activities. This includes land-based as well as water-based utilities.

4.1.3 Staging Areas and Haul Roads

In order to facilitate processing and dewatering of excavated sediments for offsite disposal, a temporary lined, stone staging area will be constructed at the site. The locations available for Contractor use to construct the staging area are shown on Drawing 2 (Appendix C). A smaller, separate staging area will also be constructed to store clean fill materials for use as the residuals cover. Details showing the typical construction of the staging area and the required components of the staging area are shown on Drawing 11 (Appendix C).

Temporary haul roads will be constructed to facilitate access to the Site and completion of construction activities. The Contractor will propose the locations of the haul roads in their Operations Plan. The access roads will be lined and will be constructed of stone, as shown in the detail provided on Drawing 11 (Appendix C).

4.1.4 Off-Loading Area

In order to facilitate transfer of dredged sediments from the in-river scow to trucks for transport to the staging area, an off-loading area may need to be constructed. If applicable, the offloading areas for the Site will be constructed in the areas shown on Drawing 3A (Appendix C). The offloading area should be constructed in order to facilitate transfer of sediments to the land-based areas and prevent dredged sediments from spilling into the river.

4.1.5 Site Control

Site control and safety measures will be installed to protect the safety of workers and residents of the City of Manistique. Measures that will be implemented at the Site include, but are not limited to, the installation of securing fencing and gates, warning signs, and concrete block walls. The Contractor will prepare a plan documenting Site control measures they will implement during construction activities as part of the Operations Plan.

4.1.6 Traffic Control

Outside of the site, access and egress routes for construction traffic will be identified by the Contractor. Signs indicating that construction vehicles will be entering and leaving the roadway will be placed in accordance with all Department of Transportation and local requirements. Measures will be taken to minimize the transfer of dirt and debris to the roadways. The Contractor will be responsible for installing these controls to protect the existing roadways. The Contractor will prepare a final Traffic Control Plan with their traffic impacts, layout of traffic control devices, and any additional traffic routes to and from local project areas (e.g., disposal facility).

4.1.7 Upland Restoration

Following the completion of remedial activities, the upland areas of the Site disturbed during remedial activities will be restored to pre-construction conditions. The Contractor will provide details regarding upland restoration with their Operations Plan.

5 SEDIMENT REMOVAL

This section presents the design criteria for the identification of sediment areas targeted for removal in Zones 3 and 4 in OU1, as well as select design components for the performance of the remedial action. The Contractor will determine the means and methods for removal to achieve the design criteria.

5.1 Design Criteria

As discussed in Section 1, a PCB SWAC of 0.2 mg/kg has been established as a preliminary remedial goal for OU1 in order to remove the BUI set forth in the Manistique River AOC. To achieve the 0.2 mg/kg SWAC it has been conservatively determined that all sediments with PCB concentrations greater than 1.0 mg/kg will be removed from within Zones 3 and 4.

5.2 Design Approach

5.2.1 Removal Area Delineation

5.2.1.1 General Removal

As presented in the Part Two FS for OU1: Zones 2, 3, and 4, there have been multiple field sampling and analytical efforts performed between 2005 and 2013 (EA and Foth, 2013c). Figures 4 and 5 illustrate all of the known surface and subsurface sediment sample collection locations used in the selection of the remedy for OU1, as well as the development of this remedial design. In addition, all sample locations on these figures are color coded to illustrate the location-specific maximum depth at which analytical results suggest the presence of PCBs at levels greater than 1.0 mg/kg.

As can be seen on Figures 4 and 5, the locations and maximum depths of sample locations with analytical results greater than 1.0 mg/kg have been used to delineate the extent and depth of proposed sediment removal in Zones 3 and 4. Removal polygons have been created around sample locations with PCB detections greater than 1.0 mg/kg by drawing connector lines between the next nearest location where analytical results indicate PCBs were not detected. In instances where there is no clean sample location between a PCB-containing sample and the shoreline, removal will proceed to the shoreline. Polygons identified for removal around specific locations are then extended down to the maximum depth of detections greater than 1.0 mg/kg and the corresponding removal depth assigned to that polygon. A dredge prism, illustrating the dredge depth and excavation contours has been developed. The dredge prism includes consideration for excavation slopes between adjacent removal areas of different depths, excavation slopes adjacent to the shoreline, and any other special considerations related to bank or

Operable Unit 1: Final Design Report

excavation side wall stability. Plan views of the dredge prism, and select cross sections illustrating excavation bottom elevations, are included in the Design Drawings (Appendix C).

With one exception, discussed further below, the dredge prism was developed using the following assumptions for the removal polygons identified in Zones 3 and 4:

- Target dredge depths are defined by sample elevations and the maximum depth of PCB concentrations greater than 1.0 mg/kg identified in sediment cores collected during previous investigations; target elevations were conservatively rounded to the next nearest foot below the elevation of the exceedance to establish the minimum depth of removal in that area.
- Transitions between the removal area boundary to the existing sediment grade in non-removal areas will be 2H:1V (i.e., 2 horizontal:1 vertical).
- For adjacent removal polygons with varying removal depths, the removal cut between polygons was tapered at a 2H:1V slope starting at the outer limit of the removal area with the deeper excavation depth.
- Where removal is necessary adjacent to the shoreline, a 3H:1V slope was used extending from the shoreline to the bottom of the removal polygon in question to promote slope stability and facilitate any shoreline restoration that may be necessary.

Overall, the resulting dredge prism provides the approximate areal extent and elevations that would need to be achieved during dredging activities to address all sediment associated with PCB detections greater than 1.0 mg/kg and is used to determine the resulting removal volume. The approximate removal volume associated with the dredge prism is approximately 3,400 cubic yards (cy) in Zone 3 and 2,000 cy in Zone 4. Note that further refinements to the dredge prism may be necessary based on potential set-backs associated with removal around infrastructure present in OU1 (e.g., docks, bulkheads), the method of environmental controls selected for dredging work, and/or the method of dredge operation. The final dredge prism and estimated removal volumes will be developed in coordination with the Contractor based on their selected removal method and related operations.

5.2.1.1 TSCA Removal Area Delineation

As presented in the Part Two FS for OU1: Zones 2, 3, and 4, there are several sample locations within Zones 3 and 4 where analytical results indicate the presence of PCBs at concentrations greater than 50 mg/kg. As a result, excavation materials associated with these locations must be handled in accordance with the appropriate TSCA regulations. Sample locations where PCB results greater than 50 mg/kg are summarized in Table 3 below.

Table 3 – Sediment Samples with PCB Results Greater than 50 mg/kg

Sample ID	Sample Depth Interval (inches)	PCB Concentration ^a (mg/kg)	TSCA Volume (cy)	Location
NOAA-C56-SED-01-02	0 - 12	900	110	Zone 3
NOAA-C56-SED-02-04	12 – 21	102		Zone 3
MRH-RSL-H-38	0 - 12	505.4		Zone 3
MRH-RSL-H-38	12 - 38	490		Zone 3
NOAA-C58-SED-01-02	0 – 5	70	25	Zone 3
NOAA-C58-SED-02-04	5 - 11	440		Zone 3
NOAA-C67-SED-02-04	10 – 20.5	69	165	Zone 3
ST14D	17.4 - 24	64.5	140	Zone 4
ST10U	70.8 – 85.2	63.2 ^b	0	Zone 3
MRH-RSL-E-12	0 – 12	51.4	110	Zone 3

^a PCB result associated with the homogenized sample depth interval.

^b Due to the depth of contamination, and the slope stability difficulties associated with the removal of 7 feet of material directly adjacent to the bank, a risk-based approval was received to leave the TSCA material in place and perform limited removal and backfill in this area.

The removal areas associated with the above listed samples and designated as TSCA materials are illustrated on Figures 6 and 7. With one exception, materials associated with these samples will be removed to full the depth and extent shown on Figures 6 and 7, and will be handled separately from non-TSCA materials.

At location ST10U in the northeastern corner of Zone 3, there are steep banks and slope stability concerns, and the proximity of the shoreline to the actual sample location, make removal to 7 feet infeasible without risk of slope and bank failure. Samples collected in the shallower depth intervals in the

vicinity of this core suggest that there are a minimum of 3 feet of clean (i.e., less than 1.0 mg/kg) material above the TSCA exceedance at 7 feet. Based on discussions with the Project Partners, a risk-based approval has been received to leave the TSCA material at 7 feet. In this area, 2 feet of material will be removed and disposed of as non-TSCA material. Following removal, clean fill will be placed across the entire extent of this area at a thickness of one foot to provide sufficient cover thickness.

5.2.2 Geotechnical Considerations

Geotechnical considerations were taken into account between dredge prisms and the shoreline throughout Zones 3 and 4. A 2H:1V slope is recommended between dredge prisms throughout Zones 3 and 4, as discussed above. It is recommended that between the shoreline and dredge prisms, a 3H:1V slope or shallower shall be used, as discussed above in Section 5.2.1.1.

Additional geotechnical considerations were taken into account along the shoreline in the area on the northeast side of Zone 3 in the vicinity of sample location ST10U. In order to protect the shoreline and adjacent existing structures during remedial construction, additional evaluations were supported by the PDI performed in August 2013 and the supplemental program performed in October 2015 (Arcadis, 2015). October 2015 borings included collecting sediment and soil samples for geotechnical laboratory testing. The in-water geotechnical borings were performed in areas of anticipated deeper excavation/dredging areas and in sloped shoreline areas. Boring logs and geotechnical laboratory testing results can be found in Appendix A. Additionally, a shoreline reconnaissance was performed in 2015, providing data and information regarding existing structures and photos of existing slopes and shorelines.

In the critical area in the northeastern area of Zone 3, in the vicinity of sample location ST10U, slope stability was evaluated to determine the stability and geometry of post-dredging slopes. Evaluations were conducted using GeoStudio Slope/W (2012) where soil parameters were input and the factor of safety of the conditions are presented. Using results from these evaluations and using engineering judgement, it is recommended that in the critical area along the north east shoreline of Zone 3 be dredged and restored to a maximum of a 3H:1V slope. The slope stability calculation package can be found in Appendix D. The calculation package includes assumptions used, slope stability modeling outputs and associated Factors of Safety. These evaluations and conclusions along the northeast shoreline of Zone 3 will minimize potential impacts to existing shoreline features and stability. No geotechnical monitoring will be required for this removal.

5.2.3 Remedial Action Design Components

5.2.3.1 Resuspension Controls

Removal activities in Zone 3 and Zone 4 may be performed in the dry with removal areas dewatered, or in the wet with removal performed through the water column. The Contractor will determine the appropriate means and methods to meet the design criteria. If removal activities are performed in the dry, turbidity curtains will be installed across the mouth of Zones 3 and 4 (during the performance of construction activities), downstream of any water diversion structures (e.g., sheetpile walls). Turbidity curtains in this manner would work in conjunction to control any suspended materials that make it past the water diversion structure within the work area.

Should material removal activities be performed through the water column, resuspension controls will be used to minimize the potential for the migration of suspended sediments out of the work area. Potential resuspension controls associated with removal in the wet include turbidity curtains installed to isolate entire zones, or mobile turbidity curtains which are moved to smaller specific work areas.

Stationary turbidity curtains installed at the mouth of either Zones 3 or 4 would be depth adjustable and anchored to the shoreline. Installation in this way isolates the entire zone from the river during the course of removal activities and maintains any suspended materials within the work area. The anchoring system for the turbidity curtain may include installation of permanent anchors on shore or in the upland area; however, under no circumstances are turbidity curtains to be anchored to shore without approval from the affected property owner. Given the limited size/space of the areas to be remediated, it is anticipated that access to the Zone 3 construction areas will generally be restricted to the public. However, if stationary turbidity curtains are used, the selected turbidity control system may be outfitted with gates to allow for access by private water vessels, as necessary, during the performance of removal activities.

Alternatively, turbidity curtains may be attached to the barge/excavation equipment as a mobile unit (e.g., moon pool dredging), and would thus be temporarily installed around only the active removal area. Turbidity controls deployed in this manner would facilitate use of the water way by non-construction vessels and access to the private marina in Zone 4; however, at certain times, access to the marina may be limited or completely restricted during Zone 4 removal activities. A final determination will be made in coordination with the owner of private marina and the Contractor after the selected turbidity control system is identified. Final turbidity control measures and potential anchoring considerations will be identified by the Contractor and included in the OM&M Plan.

In both Zones 3 and 4, removal activities in areas designated with TSCA materials will be performed with mobile turbidity controls. In these areas, the turbidity controls will be maintained closely around the perimeter of the specific removal area, thereby limiting the potential for the transport of suspended materials. As work is completed in any one TSCA removal area, any suspended materials would be allowed to resettle prior to movement to subsequent TSCA removal areas.

Additionally, turbidity curtains or silt fence will be installed at select outfall and culvert locations to limit the potential for migration of suspended materials from the work area. Specifically, stationary turbidity controls will be installed at the up- and downstream ends of the culvert connecting Zones 3 and 4, and at the outfall of a drainage ditch with discharges into the north end of Zone 3 (Drawing 3A).

With any resuspension control installation, absorbent booms will be installed as a component of the turbidity control system to protect against possible sheens generated as a result of dredging activities from migrating outside the work area. In addition, absorbent booms and/or pads will be used as necessary, to absorb any oils or sheens observed on the water surface during sediment removal operations within the turbidity control area.

Resuspension control measures will be monitored and maintained as necessary throughout the project and removed following Site restoration. In order to comply with the anticipated Joint Permit requirements, and to assess turbidity levels in the water column during remedial activities, turbidity monitoring will be performed by the Engineer at locations upstream and downstream of the mouth of Zones 3 and 4. Downstream turbidity measurements exceeding 50 nephelometric turbidity units (NTUs) more than the upstream monitoring point or 1.5 times greater than the upstream monitoring point (whichever is higher) will be resampled, investigated, and the cause of the exceedance mitigated.

5.2.3.2 Debris Removal

Side scan sonar and magnetometer surveys, and sub-bottom profiling activities were performed by AquaSurvey in October 2015, to provide additional details on possible surface debris and ferrous objects (at- or near surface). Complete discussion of the performance of these activities and the related results are provided in Appendix A. Based on the information presented in the AquaSurvey report, large woody debris may be present at several locations within or near the dredge area, the identification of which is obscured by dense vegetation. Results of the magnetometer survey suggest that there are no large ferrous debris fields (e.g., steel utilities or pipes), and that there are likely no utility corridors that traverse OU1. This will be confirmed by the Contractor prior to initiation of removal activities.

It is anticipated that all large woody debris, or any other large debris that is unmanageable in size or shape, encountered within or near the dredge area will be removed as needed to complete dredging activities. A figure identifying the approximate locations of small and large woody debris is provided in Appendix E. Any identified debris will be removed with conventional heavy equipment, and handled in accordance with the classification associated with the materials targeted for removal in the area in which the debris is encountered (i.e., woody debris removed from TSCA areas will be treated as TSCA waste). To the extent practicable based on the condition of the debris, floating woody debris, or woody debris removed from the banks that are not considered contaminated may be recycled for use at the contractor's discretion or repurposed for use on site.

5.2.3.3 Sediment Dredging

Removal of targeted sediment will be performed to target elevations depths in the areas illustrated on Drawing 4. Once debris has been removed, sediment removal will proceed to the targeted removal depth, or until bedrock is encountered. Sediment dredging elevations will be monitored with equipment-mounted GPS to track dredging depths and elevations; performance criteria and elevation tolerances are provided in the specifications (Appendix B).

The removal areas targeted for remediation within both Zones 3 and 4 will be separated into individual dredge management units (DMUs) to facilitate removal confirmation. The establishment of DMUs will facilitate the assessment of dredge removal extent as well as the performance of confirmation sampling, as further discussed below. The 6 TSCA removal areas will be established as 6 separate DMUs, with the remainder of the non-TSCA removal areas divided into 10 additional DMUs. As described in Section 5.2.1.1, TSCA material will be left in place in one TSCA DMU (DMU A; Drawing 9). The configuration and size of the respective DMUs has been selected such that the non-TSCA removal area DMUs are less than 15,000 square feet in size, and are arranged in rough sequential order such that initial removal activities can continue in an adjacent DMU while confirmation sampling is being performed. The locations and shapes of the 16 DMUs are illustrated on Drawings 9 and 10.

The exact means and methods for removal will be proposed by the Contractor. However, without respect to the selected removal method, all construction activities and equipment operation will be managed so as to minimize resuspension of material during the remediation. Following the installation of turbidity controls and the initiation of debris removal, sediment excavation will begin in Zone 3. Zone 4 activities will be initiated following the completion of Zone 3 activities to allow the marina in Zone 4 to be utilized for an annual fishing competition held in late July. Sediment offloading areas will be constructed such that

no contaminated sediments are transported in-water over previously remediated areas. In both zones, TSCA removal areas will be addressed first to minimize the potential for comingling of TSCA and non-TSCA materials and the transport of TSCA waste over already remediated areas. Excavated materials will be transferred to an on-site temporary staging area where they will be staged, dewatered and prepared for off-site disposal. TSCA and non-TSCA materials will be handled separately, and any equipment used in the handling and management of TSCA materials will be decontaminated prior to further use for non-TSCA material activities. Once the TSCA removal areas have been addressed, non-TSCA removal can proceed until confirmation sampling results suggest removal activities are complete.

5.2.3.4 Water Quality Monitoring

Water quality monitoring will be performed by the Engineer during all in-water activities. Water quality measurements will be collected from a location upstream of the project area to provide a background reference and from a location downstream of the project area as a compliance location. Details regarding the water quality monitoring program will be included in the OM&M Plan.

5.2.3.5 Residuals Management Plan

As directed by the Project Partners, following the removal of materials from each DMU, as discussed above, confirmation sediment samples will be collected to determine a SWAC (based on the top 6 inches of sediment [or remaining depth of sediment if less than 6 inches is present]) of PCBs within the respective DMUs. Each DMU will be divided into sub-DMUs, and one confirmation sample will be collected from each sub DMU. If the SWAC associated with these samples is less than 1.0 mg/kg, no additional remedial activities will be performed within that DMU. However, if the SWAC is greater than 1.0 mg/kg in any confirmation sample, up to two additional dredge passes will be conducted in the sub-DMU where feasible (e.g., no bedrock, soft sediment greater than 6 inches thick), with subsequent confirmation sampling performed after each dredge pass. If, after the final dredge pass, or there is not sufficient dredgable sediment (i.e., greater than 6 inches), the SWAC remains greater than 1.0 mg/kg, a sand cover will be placed over that DMU. This is shown in decision flow chart format on Figure 8.

Four discrete samples will be collected from within each TSCA removal area DMU and analyzed for PCBs. If the SWAC of the analytical results within a TSCA removal area DMU is less than 1.0 mg/kg, no additional remedial activities will be performed within that DMU; however, if analytical results associated with any of the four samples exceeds 1.0 mg/kg, the results and location of the exceedance will be documented. In non-TSCA DMUs, three samples will be collected from within each DMU to represent the

entire area at an approximate sample density of one per 5,000 sf. Preliminary locations for confirmation samples to be collected in both TSCA and non-TSCA DMUs are illustrated on Drawings 9 and 10.

The residuals management plan described herein does not apply to DMU A. As described in Section 5.2.1.1, sediment in this DMU will be removed to a depth of 2 feet and 1 foot of cover placed over the entire DMU post removal.

5.2.3.6 Cover Placement

In the event that the SWAC in any DMU (except DMU A) remains greater than 1.0 mg/kg following the performance of additional removal, a sand cover will be placed over the extent of that DMU. In this instance, 6 inches of clean sand imported to the Site will be placed over the limits of the DMU, thereby creating a clean cover over any residuals remaining in the DMU. Sand will be imported to the Site from a verified clean source, with pre-placement confirmation analytical details provided for review prior to placement.

Clean sand will be temporarily staged on-site within the upland staging area discussed above. When needed for cover placement, sand materials will be transported to the placement area, and placed within the DMUs identified for cover placement. Sand placement will be performed using the same conventional equipment discussed above, decontaminated prior to use with clean cover materials. Cover placement will be confirmed based on anticipated placement volumes, and cover thickness probing. Additional details regarding cover placement confirmation will be provided in the OM&M Plan.

5.2.3.7 Restoration

Minimal restoration will be performed within the river. No restoration will be conducted in the river bed, based on discussions with the Project Partners. The shorelines will be restored to pre-construction conditions based on disturbance in the field. If any riprap is removed from the shorelines in order to facilitate removal, it will be replaced in kind. The material may be reused if it is washed and decontaminated prior to placement. All restoration activities will be conducted in accordance with permit requirements.

6 SEDIMENT DEWATERING AND WASTEWATER TREATMENT

This section presents the design criteria and approach for the sediment dewatering and wastewater treatment components of the remedial action. The Contractor will determine the means and methods to satisfy the design criteria.

6.1 Design Criteria

6.1.1 Sediment Properties

In October 2015, in-water geotechnical borings were performed in anticipated deeper sediment removal and shoreline areas. These geotechnical data were collected to supplement geotechnical data collected in August 2013, which included paint filter test results, particle/grain size, Atterberg limits, specific gravity, moisture content, and unified soil classification (EA and Foth, 2013c).

Results of sediment geotechnical testing indicate that sediment consists of poorly graded gravel, poorly graded sand, and silty sand. In-situ water contents measured during the August 2013 and October 2015 sampling events ranged from 12.2% (Weight of Water/Weight of Sediment [Ww/Ws]) and 480.8% (Ww/Ws), with an average of 141.5% (Ww/Ws). Paint filter testing performed on collected sediment in 2013 indicated that sediment would require dewatering prior to being transported off-site.

6.1.2 Influent Characteristics

In October 2015, the Effluent Elutriate Test (EET) was performed to characterize filtrate water quality according to the procedure provided in the Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities - Testing Manual (USACE, 2003). As stated in the PDI Work Plan (Arcadis, 2015), the objective of the EET was to characterize decant water quality from the dewatering process to inform potential water treatment requirements.

EET results are provided in Appendix A. The results indicate that total PCB concentrations in elutriate ranged from 1 to 1.9 microgram/Liter ($\mu\text{g/L}$) and total suspended solids (TSS) ranged from 12 to 41 milligram/liter (mg/L).

While total mercury is not a COC associated with the sediment removal action, a total mercury limit is established in the NPDES permit for the City of Manistique wastewater treatment plant (WWTP). Total mercury concentrations were not evaluated during the October 2015 EET analyses. To estimate potential

total mercury concentrations in dewatering wastewater, the sediment/water partitioning equation below was applied to bulk sediment chemistry results collected in August 2013 (EA and Foth, 2013b).

$$C_s = C_w \left[K_d + \frac{\theta_w}{\rho_b} \right]$$

Where,

C_s = Sediment Mercury Concentration (mg/L)

C_w = Porewater Mercury Concentration (mg/L)

K_d = Soil-water Partition Coefficient (L/kg)

θ_w = Water-filled Soil Porosity (L/L)

ρ_b = Dry Soil Bulk Density (kg/L)

Using the method above, the total mercury concentration in sediment porewater was estimated to be 42 µg/L.

6.1.3 Discharge Limits

Wastewater generated during sediment dewatering may be pre-treated onsite and discharged to the nearby City of Manistique WWTP. In accordance with the City of Manistique Sewer Use Ordinance, industrial discharges may not cause deviations from the NPDES permit for the City of Manistique WWTP. The preliminary pre-treatment requirements determined based on the discussion with the City of Manistique WWTP, the NPDES permit for the City of Manistique WWTP, and the Sewer Use Ordinance are provided in Table 4. In addition, concentrations of total PCBs and total mercury in water discharged to the City of Manistique WWTP will be treated to non-detect.

Table 4 – Preliminary Wastewater Pre-Treatment Requirements

Constituent	Effluent Limit	Source	Sampling Frequency
Fat, oil, grease (FOG)	100 ppm	City of Manistique Sewer Ordinance	5 days/week*
pH	6.5-9.5	City of Manistique Sewer Ordinance	Daily
Carbonaceous Biochemical Oxygen Demand (CBOD)	25 mg/L monthly 40 mg/L 7-day	Manistique WWTP NPDES Permit	5 days/week*
Ammonia (NH ₃)	^a	Manistique WWTP NPDES Permit	5 days/week*
Total Phosphorus	1.0 mg/L	Manistique WWTP NPDES Permit	5 days/week*
TSS	30 mg/L monthly 45 mg/L 7-day	Manistique WWTP NPDES Permit	5 days/week*
VOCs	^b	Manistique WWTP NPDES Permit	Initial/monthly
SVOCs	^b	Manistique WWTP NPDES Permit	Initial/monthly
Specific Organic Compounds (SOC)	^b	Manistique WWTP NPDES Permit	Initial/monthly
PCB	^b	Manistique WWTP NPDES Permit	Initial/monthly
Total Recoverable Phenolics	^b	Manistique WWTP NPDES Permit	Initial/monthly
Total Metals	^b	Manistique WWTP NPDES Permit	Initial/monthly
Total Mercury	4.0 ng/L	Manistique WWTP NPDES Permit	Quarterly [^]
Dissolved Oxygen	5.0 mg/L	Manistique WWTP NPDES Permit	5 days/week [^]

Notes:

*Sampling frequency is for two weeks, then reduced to 3 days/week. If stable, then once per week.

[^]Sampling frequency applies to the WWTP

^aReporting of 7-day average required, no effluent limit for WWTP listed in NPDES permit.

^bNo effluent limits given, monitored annually at the WWTP for compliance with NPDES permit.

An Industrial Discharge Contract with the City of Manistique will be required to discharge treated wastewater to the City of Manistique WWTP. Discharge requirements and limits will be formally established in the Industrial Discharge Contract.

6.1.4 Wastewater Flow Rates

Allowable daily discharge to the City of Manistique WWTP should be assumed at 100,000 gallons.

The quantity of wastewater generated as a result of sediment removal and associated activities will be dependent on the methods selected for construction. In general, dewatering flows associated with hydraulic dredging methods will be much higher than mechanical construction methods.

In addition to wastewater generated during sediment dewatering, the wastewater treatment system is required to treat stormwater that contacts contaminated media during construction, and decontamination water generated during construction activities. The Contractor should design water storage, treatment, and discharge equipment to accommodate contact stormwater generated during a minimum 24-hour storm event with a 10-year recurrence interval (i.e., rainfall amount over a continuous 24-hour period that has a 10% chance of occurring in a given year).

6.2 Design Approach

6.2.1 Sediment Dewatering

Depending on the selected sediment removal method, sediment will be transported to an offloading location along the shoreline and/or pumped directly to the staging area for processing.

For mechanical sediment removal methods, sediment will be transferred from the offloading location, to the sediment dewatering pad where it will be gravity dewatered or otherwise processed. For hydraulic removal methods, sediment will be pumped to geosynthetic tubes for dewatering. Polymer will be added to flocculate sediment in the geosynthetic bags, as needed, to facilitate dewatering. Once the appropriate solids content is achieved in the geosynthetic bags, the bags will be opened, and sediment will be removed.

A drying agent (i.e., Portland cement, or equivalent) may be added to the sediment, if needed, at a rate of 5 to 10 percent by mass. During sediment dewatering, mechanical equipment may be used to turn sediment over to encourage the release of free liquids.

The dewatering pad will be constructed on a properly leveled and graded surface and will be lined using linear low density polyethylene (LLDPE) overlain with 18 inches of gravel. To segregate TSCA and non-TSCA sediment, the dewatering pad will be separated using interior barriers (e.g., concrete blocks). Following completion of TSCA removal and dewatering, the portion of the dewatering pad used to dewater TSCA sediment will be appropriately decontaminated prior to placement of non-TSCA sediment. The dewatering pad will be appropriately sized to accommodate dredging production. Wastewater released from sediment during dewatering will be collected in sumps along the downgradient side of the dewatering pad and pumped to a temporary wastewater treatment system.

During construction activities, dewatered sediments must pass the paint filter test (EPA Method 9095B) prior to off-site transport and disposal at the approved disposal facilities. Other tests required by the selected disposal facilities will also be performed by the Contractor prior to off-site transport.

6.2.2 Wastewater Treatment

A temporary wastewater pre-treatment system will be used onsite for treatment of wastewater generated during construction activities prior to discharge to the City of Manistique WWTP. The wastewater pre-treatment system will include solids removal processes and appropriate treatment processes to remove contaminants, including PCBs and mercury to non-detect concentrations and to produce effluent that meets the discharge requirements established in the Industrial Discharge Contract with the City of Manistique WWTP. The wastewater pre-treatment system will include influent and effluent sampling ports, and influent and effluent totalizers, and may also include storage tanks for untreated and treated wastewater and piping. Discharge to the City of Manistique WWTP will be performed either through the sanitary sewer or by trucking or pumping wastewater to the City of Manistique WWTP. The wastewater pre-treatment system will be constructed to accommodate daily flow generated by sediment dewatering, stormwater that contacts the dewatering pad, and decontaminated water generated during construction activities. Additionally, decant wastewater generated while transferring the dredged sediment from removal area to the dewatering pad will be collected and pumped to the temporary wastewater pre-treatment plant for onsite treatment, prior to discharging to the City of Manistique WWTP.

6.2.3 Influent and Effluent Monitoring

During the wastewater pre-treatment system operations, influent and effluent grab samples will be collected by the Contractor to evaluate influent conditions and confirm that the discharge has non-detect concentrations of total PCBs and total mercury, and meets the conditions set in the Industrial Discharge Contract with the City of Manistique WWTP. Effluent will also be monitored for general water quality parameters, including pH, turbidity, temperature, and dissolved oxygen (DO). Preliminary sampling requirements based on the communications with the City of Manistique WWTP, the NPDES permit for the WWTP, and the Sewer Use Ordinance are included in Table 4 and the Specifications (Appendix B). Specific monitoring and sampling requirements will be established upon execution of the Industrial Discharge Contract.

7 WASTE MANAGEMENT

Any sediments containing PCBs greater than or equal to 50 mg/kg are regulated for cleanup and disposal as TSCA waste. Sediments regulated as TSCA waste will be disposed of at a TSCA chemical waste landfill. All other sediment removed from the river will be treated as non-hazardous waste.

Two facilities permitted to accept TSCA level waste have been identified within a reasonable travel distance to the site. The facilities identified are as follows:

- Wayne Disposal, Inc. (Belleville, MI)
- Safety Kleen Oil Recovery Co. (Twinsburg, OH)

Non-hazardous wastes may be disposed at a Subtitle D facility. Alternative disposal options for non-hazardous waste streams include recycling or disposal at a local municipal solid waste (MSW) landfill. The appropriate disposal method will be determined based on the nature of the material requiring disposal, the potential for the material to be contaminated, and the results of appropriate disposal characterization. It is anticipated that wastes will be disposed of at Subtitle C or D facilities and potentially at a MSW landfill. Potential recycling (e.g., scrap metal, untreated logs), regeneration (e.g., Granulated Activated Carbon [GAC]), and reuse (e.g., decontaminated reusable materials and equipment) will be evaluated by the Contractor to reduce the quantity of waste to be landfilled.

A local facility is available to dispose of non-TSCA waste. The identified landfill is the MPI Acquisition Landfill located in Manistique, MI.

The Contractor may propose alternate landfills as disposal options. The Contractor must provide all waste characterization requirements associated with the landfills and demonstrate that the alternate proposed landfill(s) is a more efficient and effective disposal option.

The transportation method requirements may vary depending on the selected landfill. However, all of the identified landfills would require truck transport directly to the landfill.

8 PROJECT CLOSE-OUT AND DEMOBILIZATION

This section presents the project closeout activities to be completed by the Contractor.

8.1 Decontamination

The Contractor will be responsible for decontamination of all personnel and equipment that comes in contact with material removed from the Manistique River. Decontamination activities shall meet all TSCA requirements and shall occur within a constructed decontamination area. At a minimum, the Contractor shall decontaminate all equipment that comes in contact with the excavated materials prior to handling clean material and prior to demobilizing from the site. All waste generated during decontamination activities shall be containerized and prepared for off-site disposal.

8.2 Post-Construction Survey and Sampling

Following completion of all remedial activities, the Contractor shall conduct a post-construction survey to document the conditions of the site. The survey will be utilized to compare pre- and post-construction conditions to verify that the Contractor has restored all areas as required. Representatives from MDEQ and the Engineer will be present during any post-construction inspections and will verify that all required activities at the Site are completed. Additionally, once the sediment staging area has been removed, post-construction samples will be collected to document that no impacts from the sediments stored in the staging area exist. Samples will be collected from the same locations as pre-construction samples and at any locations where tears are observed in the liner system. If any PCB impacts are documented (above the pre-construction sample results), the impacted soils will be removed and disposed of at an appropriate landfill and the area restored to pre-construction conditions.

8.3 Demobilization

Following the completion of all remedial activities, the Contractor shall conduct the following demobilization activities:

- Dismantle the work area(s), staging area(s), and decontamination area.
- Clean/decontaminate equipment and construction-related materials prior to removal from the Site.
- Remove all material, equipment, and support structures from the Site.

9 POST-REMEDIAL ACTION ACTIVITIES

This section presents the activities to be completed following the completion of all remedial activities in OU1.

9.1 Construction Completion Report

Upon completion of the remedial activities, Arcadis will prepare a Construction Completion Report for submittal to MDEQ. The Construction Completion Report will present the following:

- A description of the remedial activities, including documentation of any variations from the approved design.
- Record drawings
- Certification Statement
- Information regarding the disposal of materials sent off Site during the remedial activities.

A professional engineer licensed in Michigan will prepare, sign, and seal the Record Drawings and Construction Completion Report. A copy of the Construction Completion Report will be provided to the City of Manistique for their records.

9.2 Post-Remediation Monitoring Activities

In order to document the effectiveness of the remedial activities in meeting the RAO of removing the fish consumption BUI from the site, monitoring activities will be conducted to measure the levels of PCBs within the fish tissue. Fish monitoring activities are conducted on a routine basis under the State of Michigan's Fish Contaminant Monitoring Program and will continue following the completion of remedial activities, therefore no additional monitoring activities will be performed as part of this contract.

9.3 Institutional Control

Following the completion of the remedial activities in OU1, an institutional control will be implemented to protect the integrity of the remedial action. DTMB will list the Site in the MiWaters system following the remedial activities in OU1. The MiWaters system is a comprehensive web-based permitting and compliance database.

10 CONSTRUCTION SCHEDULE AND SEQUENCING

Construction activities are anticipated to begin in July 2016. The following items will be completed following the submittal of the Final Design Report and prior to the start of construction:

- Permitting activities began in March 2016
- Contractor procurement will follow the DTMB process and will be completed upon the Notice of Award to the selected contractor.
- The pre-construction conference will be held immediately prior to the start of construction activities.
- Construction activities will proceed as summarized below.
 - Contractor mobilization and Site preparation will begin immediately following the pre-construction conference.
 - In-river activities, including dredging, confirmation sampling, and residuals cover placement, and bank restoration will begin following mobilization activities. Dredging activities will begin in Zone 3. Following the completion of Zone 3 activities, Zone 4 remediation will begin. Site preparation activities in Zone 4 may be completed during the dredging activities in Zone 3. Dredging in Zone 4 will be completed following activities in Zone 3 to allow for the marina to be utilized for a late-July annual fishing competition. As such remediation in Zone 4 should not begin before August 2016.
 - Sediment handling activities will begin shortly after the start of in-river activities. These activities will include sediment staging, treatment, and dewatering and sediment transportation and disposal.
 - Water treatment and transport to the water treatment plant will continue throughout the project.
 - Demobilization is expected to be completed in November 2016.

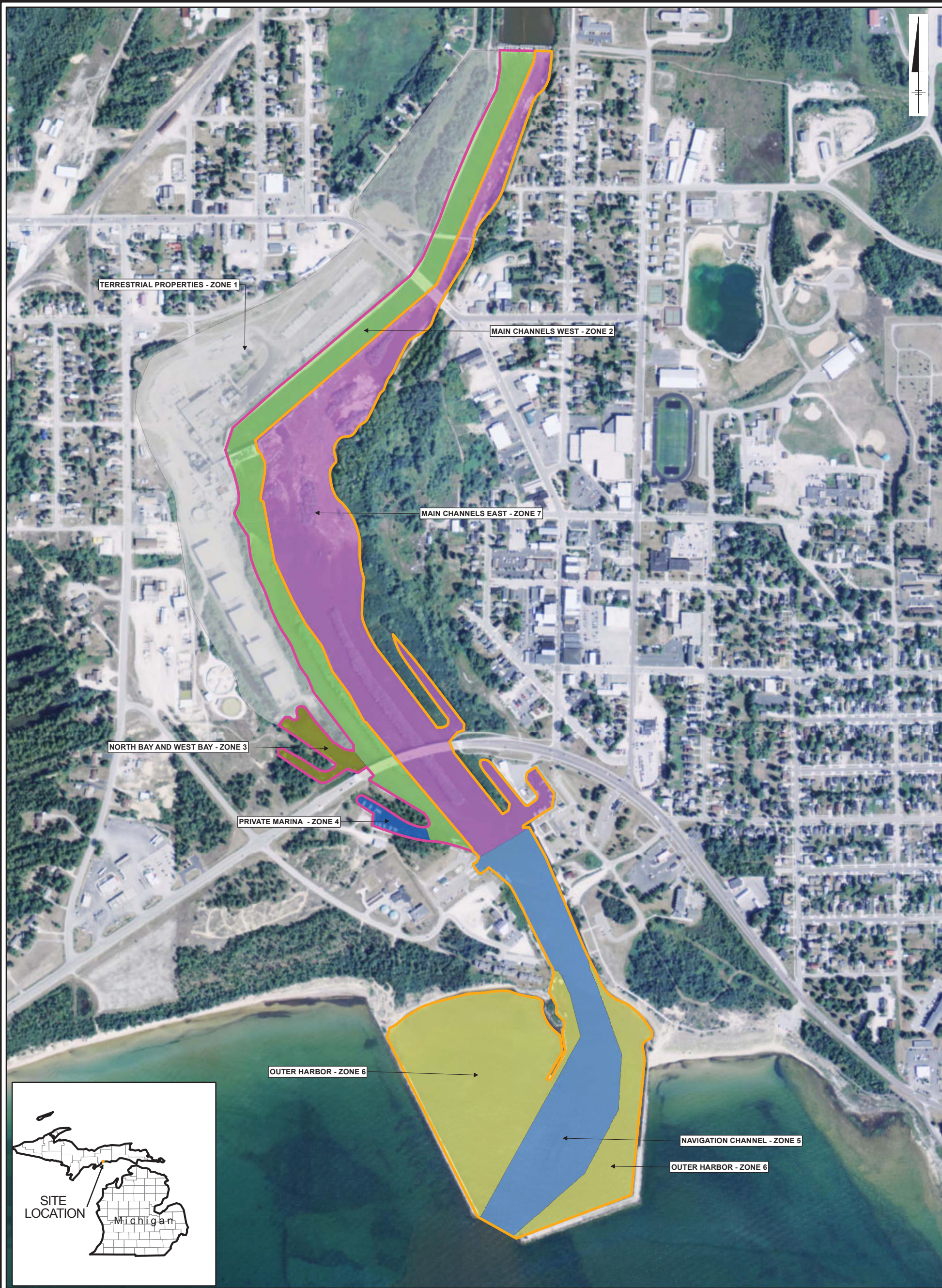
The final project schedule will be provided by the selected Contractor.

11 REFERENCES

- Anderson, E.J., C. Wu, and J. Anderson. 2013. Hydrodynamic Study of the Manistique River.
- Arcadis. 2015. OU1: Pre-Design Investigation Work Plan. Manistique Area of Concern, Schoolcraft County Michigan. August.
- CH2M HILL. 2012. Historical Document Review and Information Summary, Manistique River Area of Concern, Manistique, Michigan. Draft. U.S. Environmental Protection Agency Contract No. EP-S5-06-01.
- EA Engineering, Science, and Technology, Inc. (EA) and Foth Infrastructure and Environment, LLC (Foth). 2013a. Part One Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. June.
- EA and Foth. 2013b. Part Two Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. September.
- EA and Foth. 2013c. Final Conceptual Site Model for the Manistique River Area of Concern, Schoolcraft County, Michigan. Revision 01. April.
- EA. 2013. Field Sampling and Analysis Report for the Part Two Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. Revision 02. December.
- United States Army Corps of Engineers (USACE). 2003. Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities - Testing Manual. ERDC/EL TR-03-1. January.

FIGURES





LEGEND

Zone	
TERRESTRIAL PROPERTIES - ZONE 1	
MAIN CHANNELS WEST - ZONE 2	
NORTH BAY AND WEST BAY - ZONE 3	
PRIVATE MARINA - ZONE 4	
NAVIGATION CHANNEL - ZONE 5	
OUTER HARBOR - ZONE 6	
MAIN CHANNELS EAST - ZONE 7	

OU-1

OU-2

0 600 1,200 Feet

GRAPHIC SCALE

NOTES:

1. 2014 IMAGERY PROVIDED BY NAIP IMAGERY SERVICE LICENSED THROUGH ESRI.

2. ZONE DESIGNATIONS FROM FIGURE 3-1 OF THE PART ONE FEASIBILITY STUDY FOR OPERABLE UNIT 1: ZONES 2, 3, AND 4, MANISTIQUE RIVER AREA OF CONCERN, SCHOOLCRAFT COUNTY, MICHIGAN (EA/FOTH 2013).

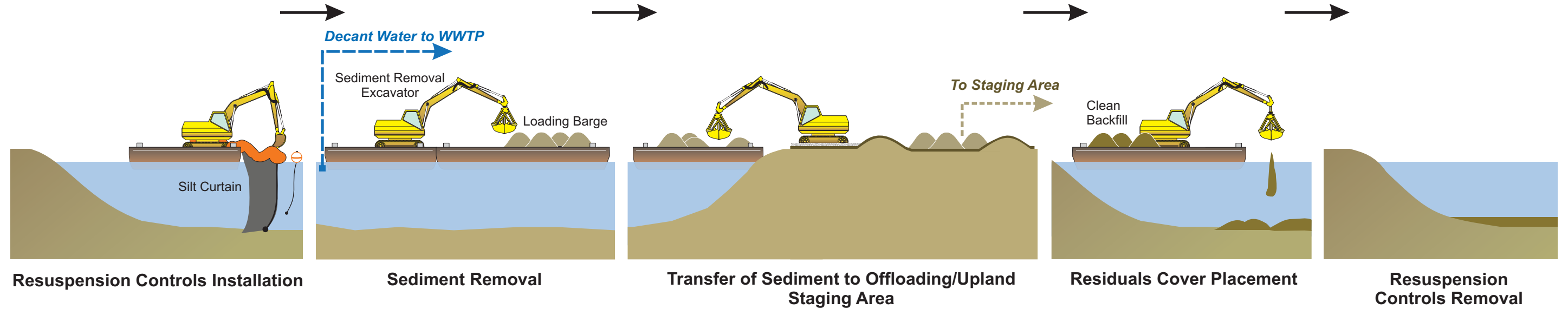
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SCHOOLCRAFT COUNTY, MICHIGAN
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SITE LOCATION MAP

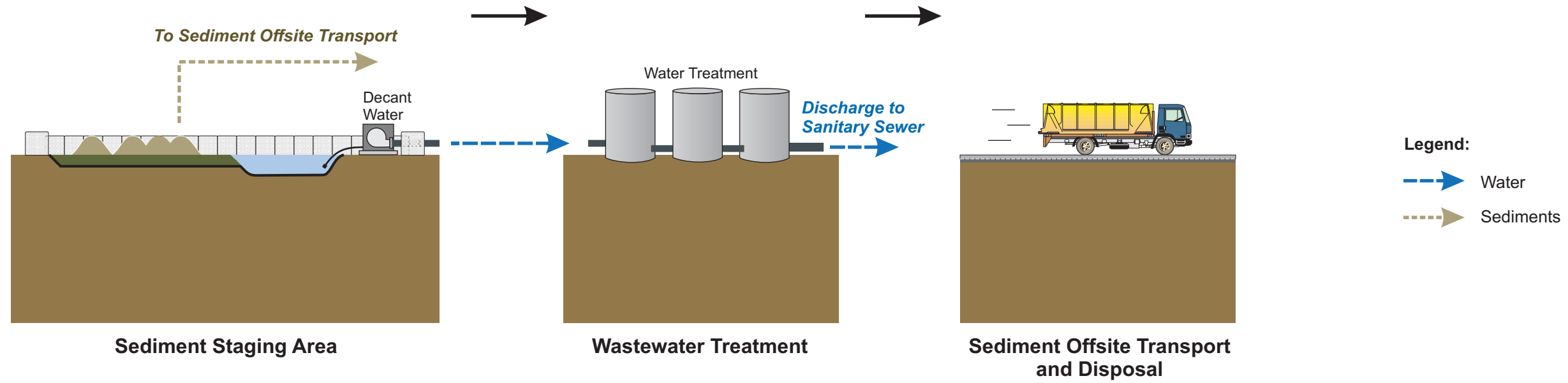
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FIGURE 1

IN-RIVER WORK



UPLAND STAGING AREA ACTIVITIES



Legend:
 ---> Water
 - - -> Sediments

NOTE:
 Other methods for removal, dewatering, and water treatment may be used pending receipt of Contractor's Operations Plan.

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**CONCEPTUAL PROCESS
 FLOW DIAGRAM**



LEGEND:

SAMPLE LOCATION WITH PCB > 1 MG/KG
BOTTOM DEPTH (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - ≥ 7

REMOVAL AREAS
TARGET DEPTH (FT):

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - ≥ 7
- POTENTIAL TSCA REMOVAL AREA

● SAMPLE LOCATION WITH PCB < 1 MG/KG

○ SAMPLE LOCATION WITH PCB > 50 MG/KG

--- PROPOSED RESUSPENSION
CONTROL LOCATION

0 60 120
Feet
GRAPHIC SCALE

NOTE:
1. 2014 IMAGERY PROVIDED BY NAIP IMAGERY
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**SAMPLE LOCATION MAP AND NEATLINE
REMOVAL AREAS - ZONE 3**

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**FIGURE
4**



LEGEND:
SAMPLE LOCATION WITH PCB > 1 MG/KG
BOTTOM DEPTH (FT)
● 0 - 1
● 1 - 2
● 2 - 3
● 3 - 4
○ SAMPLE LOCATION WITH PCB < 1 MG/KG
○ SAMPLE LOCATION WITH PCB > 50 MG/KG
— PROPOSED RESUSPENSION
— CONTROL LOCATION

REMOVAL AREAS
TARGET DEPTH (FT):
■ 0 - 1
■ 1 - 2
■ 2 - 3
■ 3 - 4
▨ POTENTIAL TSCA REMOVAL AREA

0 60 120 Feet
GRAPHIC SCALE
NOTE:
1. 2014 IMAGERY PROVIDED BY NAIP IMAGERY
SERVICE LICENSED THROUGH ESRI.

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SAMPLE LOCATION MAP AND NEATLINE
REMOVAL AREAS - ZONE 4

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FIGURE
5



LEGEND:


SAMPLE LOCATION WITH PCB > 1 MG/KG
BOTTOM DEPTH (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - ≥ 7

- SAMPLE LOCATION WITH PCB < 1 MG/KG
- SAMPLE LOCATION WITH PCB > 50 MG/KG
- TARGET DREDGE ELEVATION (FT)
- PROPOSED RESUSPENSION CONTROL LOCATION

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**SAMPLE LOCATION MAP AND
DREDGE DEPTH LIMITS - ZONE 3**



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FIGURE
6



LEGEND:

SAMPLE LOCATION WITH PCB > 1 MG/KG
BOTTOM DEPTH (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- SAMPLE LOCATION WITH PCB < 1 MG/KG
- SAMPLE LOCATION WITH PCB > 50 MG/KG

TARGET DREDGE ELEVATION (FT)

PROPOSED RESUSPENSION
CONTROL LOCATION

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SAMPLE LOCATION MAP AND
DREDGE DEPTH LIMITS - ZONE 4

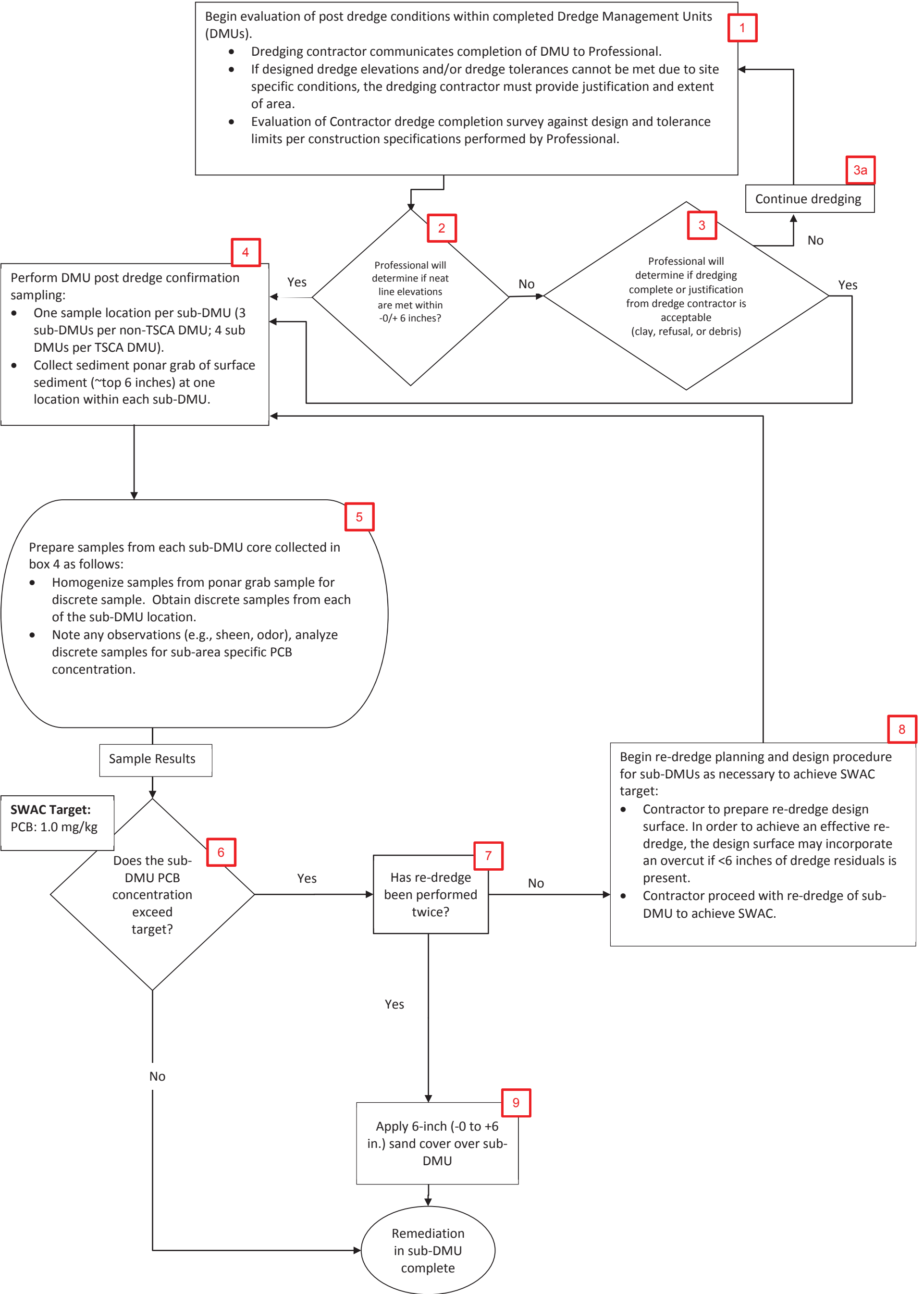


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FIGURE
7

Figure 8 - Proposed Post Dredge Management Plan – Manistique River Area of Concern

Date: March 28, 2016



APPENDICES



APPENDIX A

2015 Pre-Design Investigation Data



2015 Site Reconnaissance Information





NOTES:

- 2011 IMAGERY PROVIDED BY NAIP IMAGERY SERVICE LICENSED THROUGH ESRI.
- ZONE, DREDGE AREAS, AND TARGET DEPTHS APPROXIMATED FROM FIGURE 3-1 OF THE PART ONE FEASIBILITY STUDY FOR OPERABLE UNIT 1: ZONES 2, 3, AND 4, MANISTIQUE RIVER AREA OF CONCERN, SCHOOLCRAFT COUNTY, MICHIGAN (EA/FOTH 2013).

0 50 100 Feet
GRAPHIC SCALE

LEGEND

- PROPOSED BEDROCK PROBING LOCATIONS
- PROPOSED GEOTECHNICAL BORING LOCATION
- PROPOSED TREATABILITY CORE LOCATION
- EXISTING PCB SAMPLE LOCATION
- EXISTING BEDROCK ELEVATION LOCATION
- EXISTING GEOTECHNICAL SEDIMENT CORE LOCATION (APPROXIMATE)

- 1 MG/KG DREDGE AREAS IN ZONES 2, 3 & 4
- 50 MG/KG DREDGE AREAS IN ZONES 3 & 4
- ZONES 2, 3, & 4
- APPROXIMATE TARGET DEPTH (FEET) TO OBTAIN 1 MG/KG
 - <1
 - 1 - 5
 - 5 - 10
 - 10 - 14.5

APPROXIMATE TARGET DEPTH (FEET) TO OBTAIN 50 MG/KG WITHIN 50 MG/KG DREDGE AREA)

- <1
- 1 - 2.5
- 2.5 - 5
- 5.0 - 6.4

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ZONE 3 SAMPLE LOCATION MAP




FIGURE
3



NOTES:

- 2011 IMAGERY PROVIDED BY NAIP IMAGERY SERVICE LICENSED THROUGH ESRI.
- ZONE, DREDGE AREAS, AND TARGET DEPTHS APPROXIMATED FROM FIGURE 3-1 OF THE PART ONE FEASIBILITY STUDY FOR OPERABLE UNIT 1: ZONES 2, 3, AND 4, MANISTIQUE RIVER AREA OF CONCERN, SCHOOLCRAFT COUNTY, MICHIGAN (EA/FOTH 2013).

0 50 100 Feet
GRAPHIC SCALE

LEGEND

- PROPOSED BEDROCK PROBING LOCATIONS
- PROPOSED GEOTECHNICAL BORING LOCATION
- PROPOSED TREATABILITY CORE LOCATION
- EXISTING PCB SAMPLE LOCATION
- EXISTING BEDROCK ELEVATION LOCATION
- EXISTING GEOTECHNICAL SEDIMENT CORE LOCATION (APPROXIMATE)

- 1 MG/KG DREDGE AREAS IN ZONES 2, 3 & 4
- 50 MG/KG DREDGE AREAS IN ZONES 3 & 4
- ZONES 2, 3, & 4
- APPROXIMATE TARGET DEPTH (FEET) TO OBTAIN 1 MG/KG
 - <1
 - 1 - 5
 - 5 - 10
 - 10 - 14.5

APPROXIMATE TARGET DEPTH (FEET) TO OBTAIN 50 MG/KG WITHIN 50 MG/KG DREDGE AREA)

- <1
- 1 - 2.5
- 2.5 - 5
- 5.0 - 6.4

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ZONE 4 SAMPLE LOCATION MAP

ARCADIS

FIGURE 4

Site Reconnaissance Photographs

October 2015



1



2



3



4



5



6



7



8



9



10



11



12



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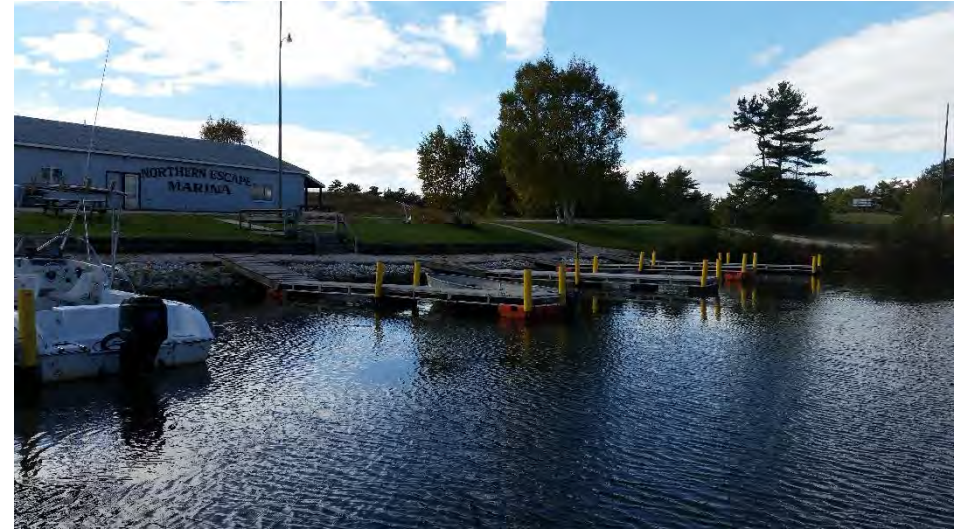
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24

Aqua Surveys, Inc. Hydrographic Survey Information





Summary of Findings –Side Scan Sonar, Multibeam Bathymetry, Magnetometer, and Sub-Bottom Surveys Manistique River Harbor, Manistique River, Michigan

A geophysical remote sensing survey was conducted covering the specified project area along the harbor of the Manistique River in Manistique, Michigan. The area surveyed consisted of two operable units, OU-1 and OU-2. OU-1 included three small offshoots of the river, two north and one south of the Route 2 Bridge. OU-2 included the mouth of the river inside the breakwaters and approximately the first 1200 feet upstream of the river. The geophysical survey was conducted on 7 and 8 October 2015. Technologies and techniques employed included real time kinematic global positioning (RTK), side scan sonar, multibeam fathometer, single beam fathometer, magnetic detection, and sub-bottom profiling.

Project control was provided by a Trimble real-time kinematic global positioning system (RTK) with centimeter accuracy. RTK corrections were supplied through Michigan's VRS service. Prior to commencing the survey, the RTK system was checked against a local NGS benchmark to insure positioning accuracy. The RTK antenna was mounted directly over the fathometers and sub-bottom profiler. The side scan sonar was towed off the side of the vessel and antenna offsets were corrected in post-processing. The magnetometer was towed at a measured fixed distance behind the vessel. Antenna position and the amount of cable deployed was entered into Hypack 2013 survey control software which very accurately models the towfish position based on tow cable length, a catenary factor, and vessel positioning data. All results are produced in Michigan North State Plane NAD 83 coordinate system with units in US international feet for the horizontal datum and both North American Vertical Datum 1988 (NAVD88) and the National Geodetic Vertical Datum of 1929 (NGVD29) vertical datums.

An Edgetech 4125-FS dual frequency 400kHz/900kHz side scan sonar system was used for the side scan sonar survey in OU-1. Survey lines spaced 25 to 50 feet apart were run parallel to the shoreline using the side scan sonar. This resulted in greater than 300 percent insonification of the project areas. Following the survey, the individual records were analyzed to detect any large objects or man-made targets that might be present. The sonar records were mosaiced using Chesapeake Technologies Sonar Wiz Map 5.0 software to provide a better overall view of the survey area and to produce a single geo-referenced image of the survey area.

The side scan sonar imagery in OU-1 shows areas of dense aquatic vegetation within each of the three offshoots (Figure 1). Due to this dense vegetation, no large objects or man-made targets were distinguishable within these areas. In the areas that did not show vegetation, no large objects or man-made targets were distinguishable.

An R2 Sonic Multibeam Sonar system was used to collect bathymetry data of areas OU-1 and OU-2. System components include the multibeam projector, an SMC-108 motion

reference unit, Hemisphere VS-110 satellite compass, Castaway CTD, and an AML Micro-X sound velocity probe. A multibeam calibration was conducted following data acquisition. This is also known as a patch test and is used to solve for the alignment values between the motion sensor reference frame and the multibeam reference frame. Standard patch test calibration lines were run to resolve the latency, pitch, roll and yaw alignments. A satisfactory bar check was conducted to verify the depths reported by the sounding equipment and subsequent data processing routines.

Multibeam data was collected at variable line spacing based on water depth to produce 100% overlap (200% bottom coverage). Survey speeds were between 3-4 knots. The average sounding density throughout the project exceeded 1 sounding per square foot. Sound velocity of the water was monitored at the sonar head during the entire survey and sound velocity profiles of the water column were taken at the beginning and end of the survey. The water column was well mixed due to the river currents.

All multibeam sonar raw data were logged in Hypack 2015 and processed using HySweep multibeam editor. Data were reviewed for any potential issues, outliers, or data drop-outs with erroneous data points removed. Soundings were corrected for the heave, pitch, roll and heading of the vessel in real time during acquisition and correlated with position data. Sound velocity profiles measured in the field were applied to the sonar data on a nearest in time basis to correct each sonar beam's path through the water column. Real time sound velocity at the sonar head was measured and applied to the data using sound velocity sensor. To maintain data quality, the soundings were manually filtered. The sonar system used is capable of recording an 80-degree swath to each side of the nadir but the data was often filtered at a lesser angle for improved accuracy of the dataset.

Water level height was generated by correcting the raw RTK height for vessel heave, pitch, roll and draft. These corrections were then applied to reduce the sounding data to the project vertical datum. Data was collected in NAVD88 for later conversion into NGVD29. The vertical difference between the datum sets at the survey area is 0.00 feet, therefore no correction was necessary to convert the data to NGVD29.

Data quality was excellent and in addition to the bathymetry generated from the data, the high data resolution and density allowed for detection of debris within the survey area. Areas of shallow water near the shorelines could not be insonified with the multibeam in some cases. In order to cover those areas a single beam fathometer was used. An Odom Echotrac CVM fathometer with a 200 kHz 4-degree transducer was used for the single beam survey. Prior to the commencement of survey operations, a bar check was conducted to adjust for draft and speed of sound in order to insure accurate sounding data. A bar check was also conducted at the end of the day to be sure the settings continued to be correct. Survey lines were run perpendicular to shore at 50 foot lane spacing. Processing included removing erroneous data points and correcting the data to NAVD88/NGVD29 based on RTK GPS corrections. The single beam and multibeam bathymetry records were combined in Hypack 2015 to provide an XYZ data file and bathymetry map using NAVD 88/NGVD29 vertical datums (Figure 2).

The magnetic survey was conducted using a Geometrics G-882 marine cesium magnetometer system. The primary objective was to detect the presence of buried utilities and objects in the survey area. During the survey, the sensor was towed from the nose tow point to keep the sensor near the bottom in order to maximize detection of submerged items without making contact with the bottom in the shallow portions of the survey areas. Survey lines spaced approximately 50 feet apart were run parallel to the shoreline using the magnetometer. The survey vessel got as close to the shore as possible without dragging the magnetometer in the sediment. Several external factors affected the quality of the magnetometer records. These included the presence of shoreline structures along the banks of the survey areas as well as vessel traffic during the survey. The strong magnetic signatures from the shoreline structures can mask the presence of small shallow and large deep ferrous objects.

Due to the nature of the survey area, advanced processing methods were used on the magnetometer data. The magnetic data was processed as total field data (which shows the overall magnetic fields present) as well as pseudo-gradiometric data (which allows better identification of individual anomalies). None of the gridding and contouring methods provided conclusive results about the presence of submerged utilities. Further processing was conducted which involved manually marking targets on each magnetometer profile. The locations of the targets were analyzed on the maps. No linear features crossing the survey area identified which would be indicative of buried utilities. Anomalies that were identified in the profiles on multiple lines were refined based on signature characteristics and the contoured pseudo-gradiometric results. A total of 8 anomalies were selected whose nature could not be identified as man-made structures during the survey. The anomalies resulting from marker poles with lights on them within the survey areas were not selected. Table 1 below shows the characteristics of the anomalies. Figure 3 shows the anomaly locations within the survey area.

Name	Easting	Northing	Type	Intensity (gammas)	Detection Length (ft)
1	26436675.4	427755.6	Dipolar	43	10
2	26436716.9	427730.3	Dipolar	212	16
3	26436797.4	427674.6	Positive	56	22
4	26437007.5	427623.9	Multi-Component	500	38
5	26436708.3	427515.9	Dipolar	261	22
6	26437303.9	427147.5	Positive	21	13
7	26437386.1	427139.4	Dipolar	21	12
8	26437462.7	427101.0	Multi-Component	375	31

Table 1. Magnetometer Targets

A SyQwest Stratabox sonar system was used to collect the sub-bottom profiling data during the survey. During the survey, the transducer was hard-mounted to the side of the survey vessel with the navigational antenna mounted directly over the transducer, eliminating offset errors. The sensor was deployed at a depth of 2 feet to minimize interference from the vessel as well as allowing surveying in relatively shallow water. The navigational data was logged at one-second intervals by the Stratabox digital recording system and electronically paired

with the sub-bottom data to allow geo-referencing of all data collected.

Sub-bottom profilers use acoustic methods to generate high-resolution (on the order of 0.5-1 ft) cross-sectional images of the marine sub-bottom to depths of up to 100 ft beneath the seafloor depending on bottom characteristics. The transmitted sound pulses travel through the water column and sub-bottom and are reflected when changes in acoustic impedance (equivalent to a material's sonic velocity times its density) are encountered. Acoustic impedance changes commonly occur at boundaries between materials (e.g., interfaces between water and sediments, sediments and gas, different types of sediments, and sediments and buried objects). The reflected sound pulses travel back to the profiler where their amplitudes, as a function of travel-time, are digitally recorded. Figure 4 shows a sample representation of the sub-bottom survey data results. All profiles were manually bottom tracked to create a surface for the bottom elevation as seen in the sub-bottom data. An additional reflector (reflector 1) was seen in most of the sub-bottom profiles that was also manually digitized. In two of the profiles an additional reflector was also identified (reflector 2) for short sections. It is possible that in certain sections of profiles the line in the image that was picked as reflector 1 is not a true reflector and is in fact an artifact from attenuation of the transmit pulse in gaseous or difficult sediments. The nature of the material generating the reflectors could not be determined from the data. Ground-truthing would be required to identify the exact composition of the underlying materials. A sediment thickness XYZ file was generated based on the difference in depth between the sediment surface and reflector 1. Figure 5 shows the result of contouring this XYZ file into an isopach map. Sediment thickness was found to typically be less than 3 to 4 feet, with the greatest penetration of 9.3 feet occurring just upstream of the boat ramp.

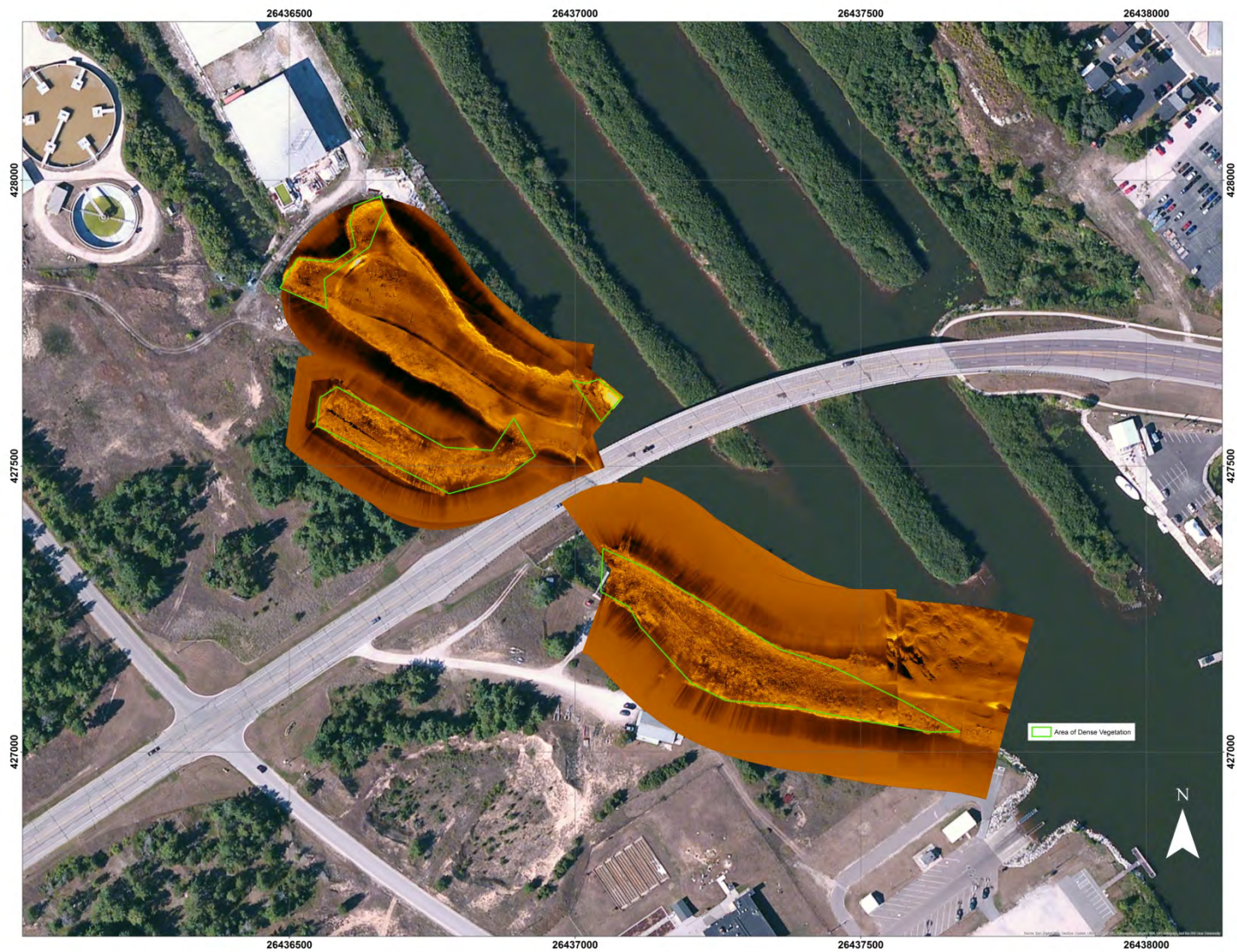


Figure 1. Side scan sonar image of OU-1 with areas of dense vegetation.



Figure 2. Bathymetry contours of OU-1 and OU-2 in NAVD 88/NGVD29 datum.

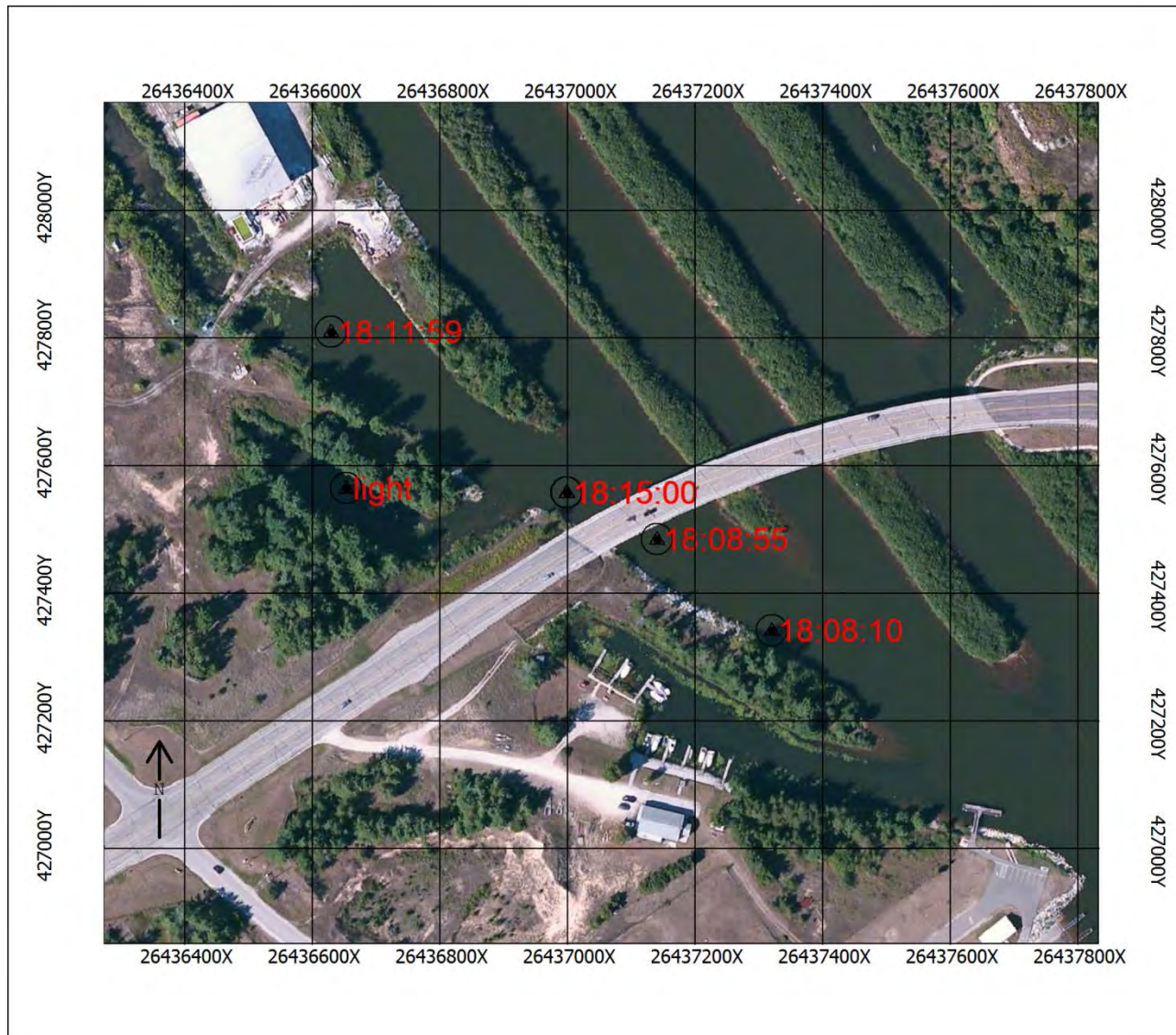


Figure 3. Magnetometer target locations in OU-1.

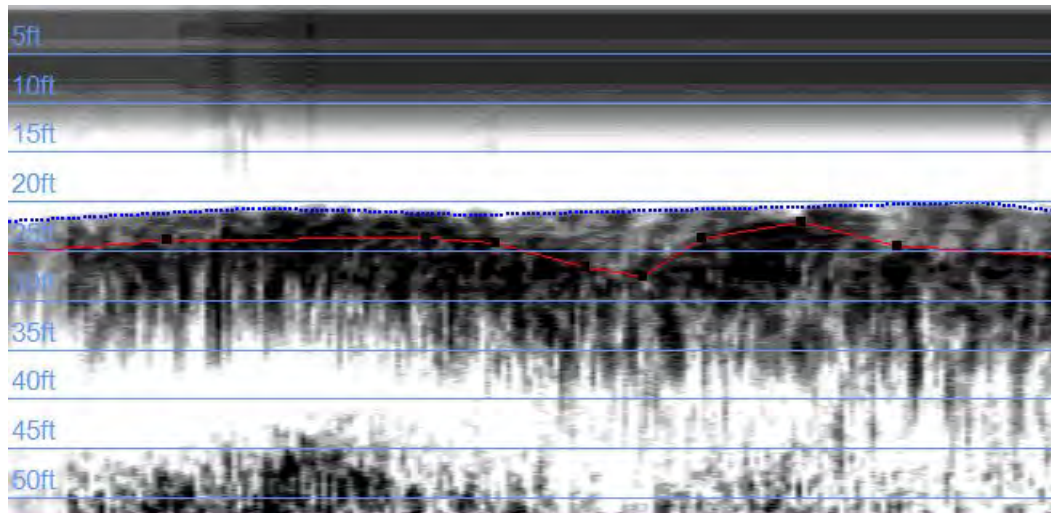


Figure 4. Example of sub-bottom profile processing. The blue dotted line indicates the river bed and the red tracking line indicates the reflector layer.

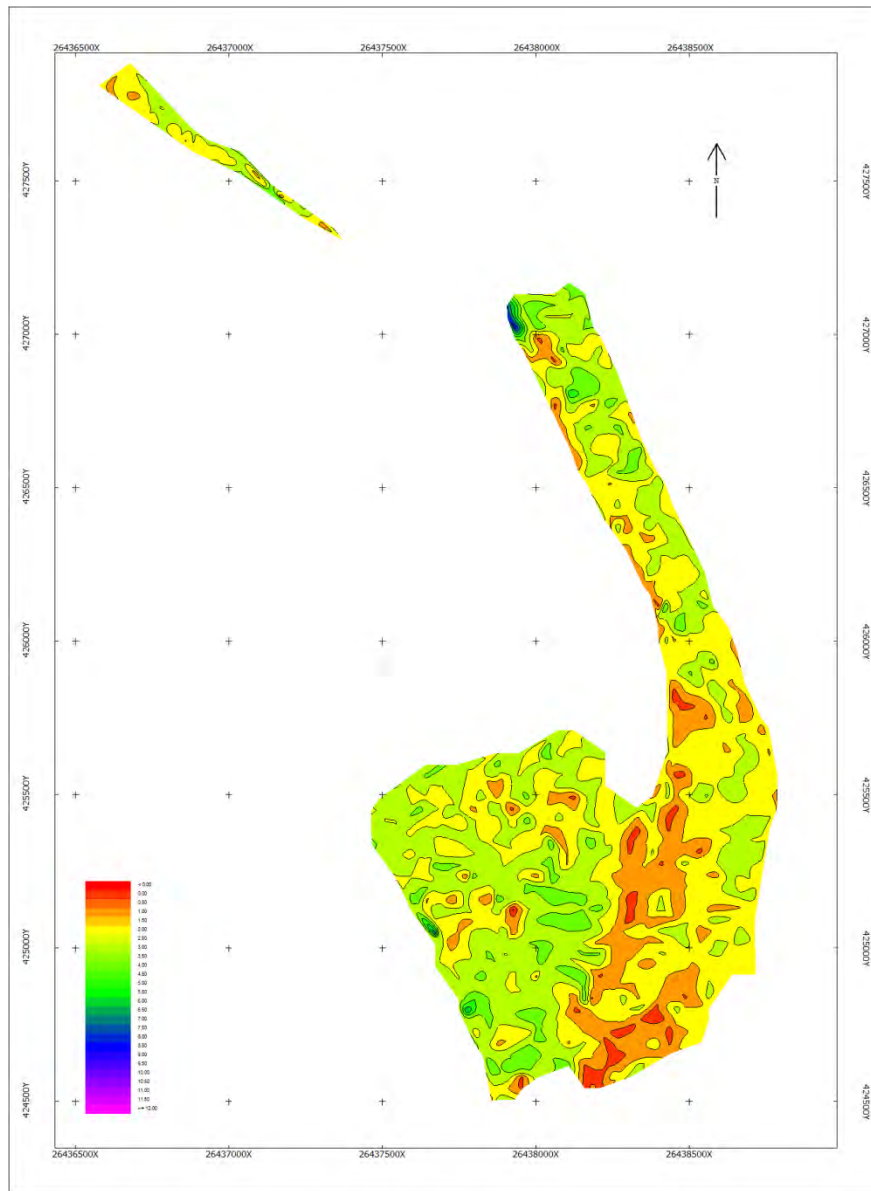



Figure 5. Sediment thickness isopach map of areas OU-1 and OU-2.

Geotechnical Boring Logs and Laboratory Data





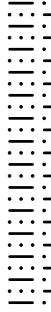



Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427936.103 Easting: 26436588.275 Borehole Depth: 13 feet bss Water Depth: 10 feet Sediment Elevation: 570.194 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B01 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
--	--	--

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	570	1	0-2	4.5	WOR WOR 1	1			Black very fine SAND and SILT, trace Organics, well sorted, very loose, wet.	
					WOH				Grayish-brown small to large subround to subangular GRAVEL, little Silt, little fine to medium Sand, poorly sorted, very loose, wet.	
		2	2-4	10.5	WOH WOH WOH	WOH			Gray Organic SILT, trace Clay, trace fine subround Sand, trace Organics, high plasticity, rapid dilatancy, very loose, wet.	
					WOH				Brown Silt and Clay seam, high plasticity, slow dilatancy at 3.7 feet bss.	
5	565	3	4-6	7.0	WOH WOH 2	2			Brown fine subround to subangular SAND, well sorted, dense, wet.	
					2				Trace small Pebbles between 6.0 and 6.1 feet bss.	
		4	6-7	6.0	3 5 3 3	8			Dark grayish-brown WOOD.	
10	560	R-1	8-13	38.0	NA	48%			Rock core conducted from 8.0 to 13.0 feet bss. Brown SILTSTONE, moderately fractured, slightly to moderately weathered. Average coring time: 5:28 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
15	555								End of boring at 13 feet bss.	

 <div>Design & Consultancy for natural and built assets</div>	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.


Date Start/Finish: 10/8/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427863.816 Easting: 26436561.385 Borehole Depth: 15 feet bss Water Depth: 6.5 feet Sediment Elevation: 580.627 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B02 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <h1>DRAFT</h1>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	580	1	0-2	NR	1 1 2	2			NO RECOVERY.	
		2	2-4	6.5	3 3 2 2	5			Dark brown fine to medium subround to subangular SAND and WOOD, little Silt, trace small subround Pebbles, poorly sorted, loose, wet.	
5	575	3	4-6	NR	1 1 1 2	2			NO RECOVERY.	
		4	6-8	17.0	1 1 1 1	2			Brown fine to medium subround to subangular SAND, little Silt, trace Clay, poorly sorted, very loose, wet. Light brown CLAY, trace Silt, no dilatancy, soft, high plasticity, wet. Silt parting at 6.75 feet bss. Silt parting at 7.25 feet bss. Silt seam at 7.6 feet bss.	
		5	8-9.7	21.0	WOH WOR WOH 50/3"	WOH			Light brown CLAY and SILT, little fine to medium subround to subangular Sand, slow dilatancy, low plasticity, very soft, wet.	
10	570								Refusal at 9.9 feet bss due to sedimentary Rock.	
		R-1	10-15	47.5	NA	22%			Rock core conducted from 10 to 15 feet bss. Brown and gray SILTSTONE, highly fractured, moderately to heavily weathered. Average coring time: 8:00 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
15	565								End of boring at 15 feet bss.	

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
--	---


Date Start/Finish: 10/8/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427860.139 Easting: 26436667.759 Borehole Depth: 11.8 feet bss Water Depth: 10.1 feet Sediment Elevation: 577.341 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B03 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
580										
0		S-1	0-2	NR	WOR WOR WOH WOH	0			NO RECOVERY.	<div>Borehole backfilled with Bentonite to sediment surface</div>
575		S-2	2-4	NR	WOR WOR WOR WOR	0			NO RECOVERY.	
5		S-3	4-6	11	WOR WOR WOH WOH	0			Brown fine to coarse subround to subangular SAND, trace Silt, poorly sorted, loose, wet. Chunks of wood.	
		S-4	6-6.8	10	WOR WOH/3'	NA			Brown CLAY and SILT, little fine Sand, medium plasticity, slow dilatancy, verysoft, wet.	
									Brown fine to medium subround to subangular SAND, little Clay, some Silt, medium plasticity, poorly sorted, wet.	
									Angular pieces of SILTSTONE, trace Silt.	
570					NA				Rock core conducted from 6.8 to 11.8 feet bss. Brown SILTSTONE, slightly fractured, slightly weathered. No fractures, non-weathered 9.8 to 11.8 feet bss. Average coring time: 6:09 minutes per foot.	
					NA					
10		R-1	6.8-11.8	53	NA	68%				
					NA					
565									End of boring at 11.8 feet bss.	
15										

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
--	---


Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427789.901 Easting: 26436497.719 Borehole Depth: 15.5 feet bss Water Depth: 4.5 feet Sediment Elevation: 581.176 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B04 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0										
580		1	0-2	7.5	1 WOH WOH WOH	WOH			Grayish-brown fine to medium subround to subangular SAND, trace Silt, poorly sorted, very loose, wet. Organics (twigs, leaves), trace Gravel at 0.0 feet bss. Wood at 1.0 feet bss. Wood at 2.0 feet bss.	
		2	2-4	0.0	1 WOH WOH 1	WOH			NO RECOVERY. WOOD Debris.	
5		3	4-6	2.0	WOR WOH WOH WOH	WOH			Black/brown trace fine to medium subround to subangular SAND and WOOD, very loose, wet.	
575									Black/grayish-brown very fine subround SAND and WOOD, some Silt, trace medium Sand to granular, poorly sorted, very loose, wet.	
		4	6-8	9.0	WOH 1 1	1			Light brown fine round to subround SAND, well sorted, very loose, wet. WOOD filler (shavings), trace small Pebbles, very loose, wet.	
10		5	8-10	7.5	5 6 10 7	16			Light brown fine to medium subround to subangular SAND, trace Gravel, poorly sorted, medium dense, wet.	
		6	10-10.2	2.0	50/2"	NA				
570									Rock core conducted from 10 to 15 feet bss. Light brown SILTSTONE, moderately to highly fractured, moderately weathered. Average coring time: 5:48 minutes per foot.	
		R-1	10.5-15.5	57.0	NA	23%				
15										
									End of boring at 15.5 feet bss.	

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
--	---

Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427668.920 Easting: 26436695.103 Borehole Depth: 13.3 feet bss Water Depth: 10 feet Sediment Elevation: 580.834 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B05 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	580	1	0-2	4.0	WOR	WOH			WOOD, black/dark brown fine to medium subround to subangular SAND, little Silt, poorly sorted, very loose, wet.	
		2	2-4	6.5	WOH	15			Dark brown fine to medium subround to subangular SAND, little Silt, trace Organics (small twigs), well sorted, medium dense, wet.	
									WOOD, dark brown fine to medium subround to subangular Sand, little Silt, trace Organics (small twigs), well sorted, medium dense, wet.	
5		3	4-6	9.0	WOH	8			Grayish-brown fine to medium round to subround SAND and SILT, well sorted, loose, nonplastic, wet.	
	575								Medium to large subround to subangular Gravel from 5.7 to 6.0 feet bgs.	
		4	6-8	15.0		8			Grayish-brown fine to coarse subround to subangular SAND, little granules to small subround to subangular Gravel, trace Silt, poorly sorted, loose, wet.	
		5	8-10	24.0	WOH	2			Brown SILT and CLAY, little fine Sand, slow dilatancy, medium plasticity, very soft, wet.	
10									Brown fine SAND and SILT, non-plastic, very loose, wet.	
	570	6	10-12	24.0	WOH	3			Brown very fine round SAND, trace Silt, well sorted, medium dense, wet.	
									Brown SILT, some fine to medium Sand, trace Clay, rapid dilatancy, medium plasticity, wet.	
		7	12-13.3	10.0		50+			Gray small to very large subround to angular GRAVEL, little coarse subround to angular Sand to granules, trace Silt, poorly sorted, very dense, wet.	
									LIMESTONE/SILTSTONE. Bedrock at 13.0 feet bss.	
15									Refusal at 13.3 feet bss. End of boring at 13.3 feet bss.	
	565									




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 for natural and
 built assets

Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.

Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427499.442 Easting: 26436644.989 Borehole Depth: 13.9 feet bss Water Depth: 4.5 feet Sediment Elevation: 580.642 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B06 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	580	1	0-2	0.0	WOR WOR WOH WOH	WOH			NO RECOVERY.	
		2	2-4	0.0	WOH WOH WOH WOH	WOH				
5	575	3	4-6	2.0	WOH WOH WOH 2	WOH			Gray fine to medium round to subround SAND and WOOD, trace Silt, well sorted, medium dense, wet.	
		4	6-8	19.0	6 7 6 7	13	X		Gray SANDY SILT, nonplastic, dense, wet. Wood from 6.0 to 6.1 feet bss. Gravel and Pebbles from 6.5 to 6.7 feet bss.	
		5	8-10	24.0	1 WOH 1 WOH	1	X		Brown CLAY and SILT, little fine Sand, trace Gravel, low plasticity, slow dilatancy, very soft, wet.	
10	570	6	10-12	16.0	1 1 1 3	2			Very fine Sand and Silt seam at 10.0 to 10.1 feet bss.	
		7	12-13.9	24.0	9 13 10 50/3"	23	X		Brown SANDY CLAY, some fine subrounded to angular Gravel, few Silt, low plasticity, wet. Brown CLAY and SILT, little fine Sand, trace Gravel, low plasticity, slow dilatancy, very soft, wet.	
15	565								Sedimentary rock (possible SILTSTONE). Bedrock at 13.7 feet bss. Refusal at 13.9 feet bss. End of boring at 13.9 feet bss.	Borehole backfilled with Bentonite to sediment surface




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Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.


Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427347.923 Easting: 26436983.484 Borehole Depth: 12.8 feet bss Water Depth: 3.5 feet Sediment Elevation: 575.850 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B07 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <h1>DRAFT</h1>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0										
575		1	0-2	7.0	WOH WOH 1	1			Black fine to medium subround to aubangular SAND, little Silt, well sorted, very loose, wet. Some Organics from 0.0 to 1.0 feet bss. Grayish brown to brown, trace Organics from 1.0 to 3.3 feet bss.	
		2	2-4	8.0	WOH WOH WOH	WOH	X		Brown, trace Silt, dense. Grayish brown. Some Wood from 4.0 to 4.2 feet bss. Trace wood shavings from 4.2 to 8.0 feet bss.	
5		3	4-6	13.0	1 2 WOH	2	X			
570		4	6-8	4.0	WOH WOH WOH	WOH				
		5	8-10	15.0	WOH WOH 1	1			Trace Wood shavings	
10					12				Apparent COBBLE.	
565		6	10-12	18.0	1 3 10 4	13	X		Brown fine to medium subround SAND, well sorted, medium dense, wet.	
		7	12-12.8	8.0	21 50/2"	NA	X		Brown fine to medium subround to subangular SAND and small to large subround to angular GRAVEL, poorly sorted, medium dense, wet.	
									Brown SILTY fine subrounded to subangular SAND, little Clay, little Gravel, low plasticity, rapid dilatancy, poorly sorted, dense, wet.	
									Refusal at 12.8 feet bss. End of boring at 12.8 feet bss.	
15										
560										

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
--	---

Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427163.837 Eastings: 26437325.104 Borehole Depth: 4.7 feet bss Water Depth: 5.2 feet Sediment Elevation: 578.844 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B08 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
580										
0		1	0-2	4.0	WOH WOH WOH	WOH			Black very fine to fine round to subround SAND, some Silt, trace Wood/Organics, well sorted, very loose, wet. Grayish brown, little Silt from 1.0 to 2.0 feet bss.	
575		2	2-4	0.0	WOH WOH WOH	WOH			NO RECOVERY.	Borehole backfilled with Bentonite to sediment surface
		3	4-4.7	0.0	WOR 50/1"	NA				
5									Refusal at 4.7 feet bss. End of boring at 4.7 feet bss.	
570										
10										
565										
15										

 <div>Design & Consultancy for natural and built assets</div>	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.



ATLANTIC TESTING LABORATORIES

Canton
6431 U.S. Highway 11
P.O. Box 29
Canton, NY 13617
315-386-4578 (T)
315-386-1012 (F)

November 9, 2015

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, Michigan 48116

Attn: Ms. Lisa M. Tomlinson, CPM
Certified Project Manager 1

Re: Geotechnical Laboratory Analysis
Manistique River and Harbor
B0038001.003
Manistique, Schoolcraft County, Michigan
ATL No. CD7311D-01-11-15

Ladies and Gentleman:

At the request of Ms. Lisa Tomlinson, representing ARCADIS U.S., Inc. (ARCADIS), and in accordance with our proposal (ATL File No. CD998-387X-08-15, dated August 14, 2015), Atlantic Testing Laboratories, Limited (ATL) performed a geotechnical laboratory analysis for the referenced project.

Select soil samples were submitted to ATL's geotechnical laboratory for physical analyses. Water Content Determination of Soil (ASTM D 2216) was performed on twenty (20) soil samples.

A Particle Size Analysis without Hydrometer (ASTM D 422) was performed on fourteen (14) soil samples. The Particle Size Distribution Curves and moisture contents are included on the **Particle Size Distribution Curves** included in **Appendix B**.

Liquid Limit, Plastic Limit, and Plasticity Index (Atterberg Limits) (ASTM D 4318) were performed on nine (9) soil samples. The results are included in **Appendix A, Laboratory Test Results**.

Specific Gravity (ASTM D 854) was performed on six (6) soil samples. The results are included in **Appendix A, Laboratory Test Results**.

The soil samples obtained during this investigation will be retained for a period of 6 months and subsequently discarded, unless otherwise instructed.

Please contact our office if you have any questions or if we may be of further service. We look forward to our continued association to obtain a successful completion of the project.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited

A handwritten signature in blue ink, appearing to read "A.D. Woods", is written over a horizontal line.

Aaron D. Woods, IE
Engineer

ADW/AJS/adw

Enclosures

APPENDIX A
LABORATORY TEST RESULTS



ATLANTIC TESTING LABORATORIES

Client: Arcadis
Project: Manistique River AOC

ATL Report No.: CD7311SL-01-11-15
Report Date: November 9, 2015

Boring ID	Sample No.	Depth (ft bss)	Soil Class.	Particle Size Analysis Percent Passing						Moisture D2216 (%)	Atterberg Limits D4318			Specific Gravity D854
				3/4"	1/2"	#4	#10	#40	#200		LL	PL	PI	
AUS-B01	S-2	2-4	OH							232.4	239	105	134	1.85
AUS-B01	S-3	4-6	SP				100	98	2.3	22.8				
AUS-B02	S-4B	6-8	CH							40.0	58	18	40	2.67
AUS-B02	S-5	8-10	ML							17.1	21	11	10	
AUS-B03	S-3	4-6	CL							32.7	49	16	33	
AUS-B04	S-1	0-2	SP			100	99	82	3.7	28.8				
AUS-B04	S-5	8-10	SP		100	96	96	94	2.7	21.6				2.66
AUS-B05	S-2	2-4	SP			100	99	92	2.7	28.7				
AUS-B05	S-3	4-6	ML				100	98	48	26.5				2.69
AUS-B05	S-5	8-10	CH							37.1	54	17	37	
AUS-B05	S-6A	10.5-11	SM					100	41	21.0				
AUS-B05	S-6B	11-12	CL		100	97	95	92	74	26.7	44	15	29	
AUS-B06	S-4	6-8	ML				100	99	55	27.3				
AUS-B06	S-5B	8.5-10	CL							17.4	24	10	14	2.74
AUS-B06	S-6A	12-12.3	CL	100	94	94	92	87	71	32.5	39	13	26	
AUS-B06	S-6B	12.3-12.9	SC	100	81	73	69	60	41	9.5	21	13	8	
AUS-B07	S-2	2-4	SP				100	99	1.1	28.5				
AUS-B07	S-3	4-6	SP				100	95	1.1	24.7				
AUS-B07	S-6	10-12	SP				100	78	1.5	18.5				2.67
AUS-B07	S-7	12-12.8	SM	100	89	81	74	63	40	10.3				

Reviewed By:

Judy Ames

Date:

11/9/15

APPENDIX B

PARTICLE SIZE DISTRIBUTION CURVES



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-01-10-15

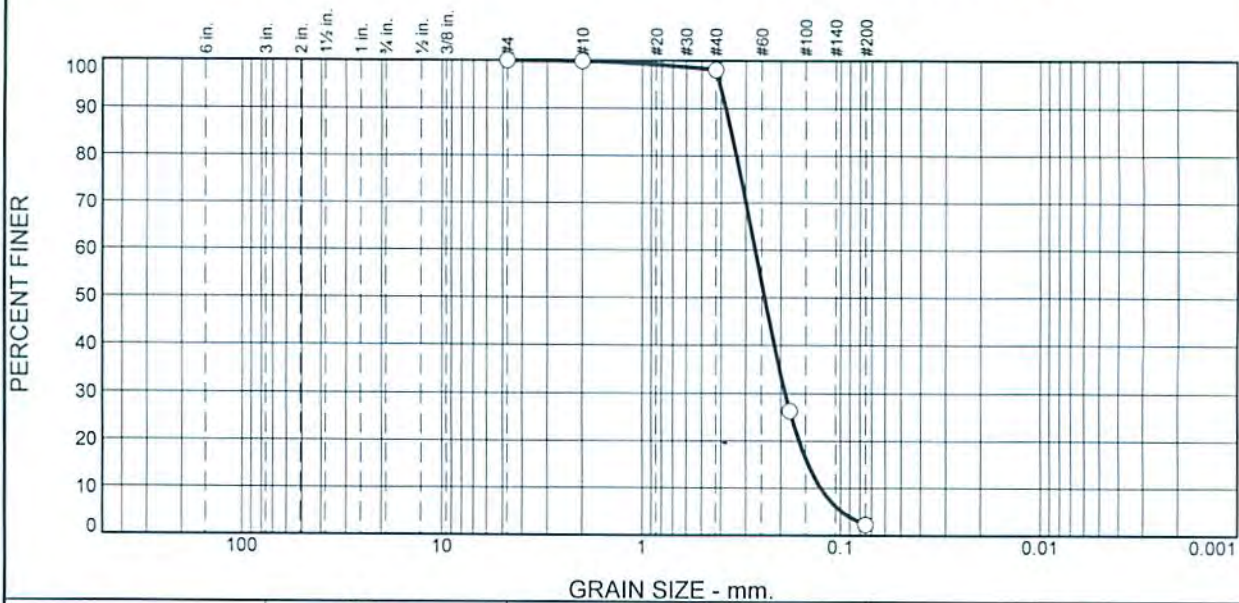
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B01; S-3 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 4-6'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	96	2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	98		
#80	26		
#200	2.3		

* (no specification provided)

Soil Description

PL= -- **Atterberg Limits** LL= -- PI= --

Coefficients
D₈₅= 0.3552 D₆₀= 0.2690 D₅₀= 0.2414
D₃₀= 0.1899 D₁₅= 0.1454 D₁₀= 0.1258
C_u= 2.14 C_c= 1.07

USCS= SP **Classification** AASHTO=

Remarks
Moisture Content = 22.8%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judy Ames

Date: 11/9/15



Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-02-10-15

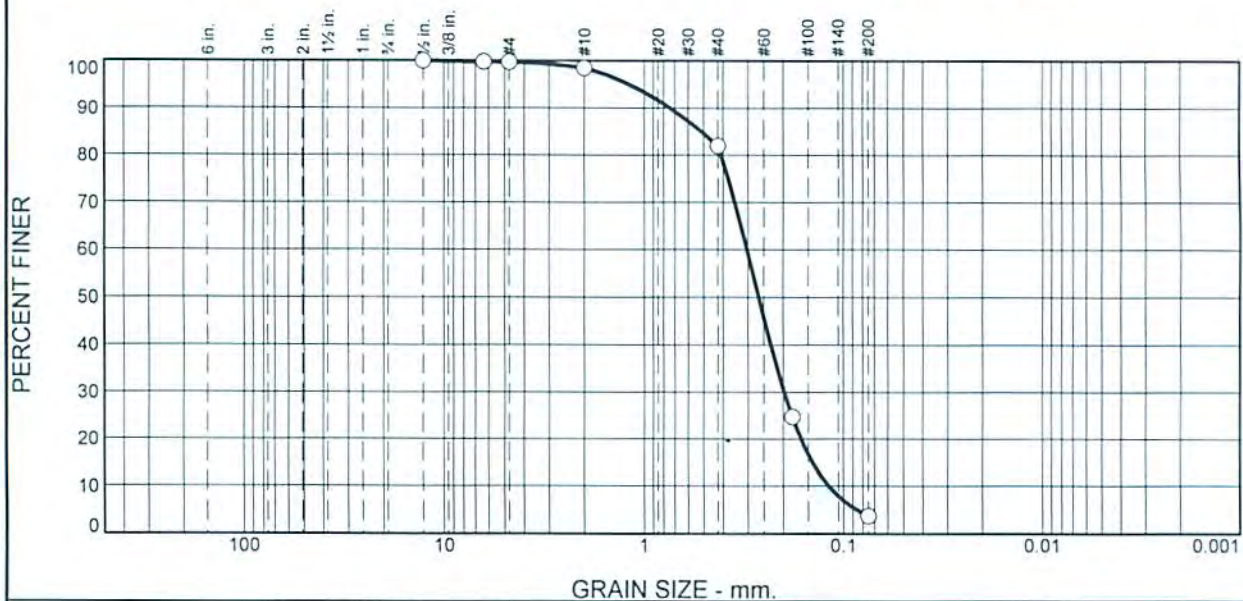
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B04; S-1 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 0-2'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	17	78	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
1/4"	100		
#4	100		
#10	99		
#40	82		
#80	25		
#200	3.7		

Soil Description

Atterberg Limits
 PL= -- LL= -- PI= --
Coefficients
 D₈₅= 0.5133 D₆₀= 0.3034 D₅₀= 0.2647
 D₃₀= 0.1976 D₁₅= 0.1429 D₁₀= 0.1186
 C_u= 2.56 C_c= 1.09
Classification
 USCS= SP AASHTO=
Remarks
 Moisture Content = 28.8%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judy Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-03-10-15

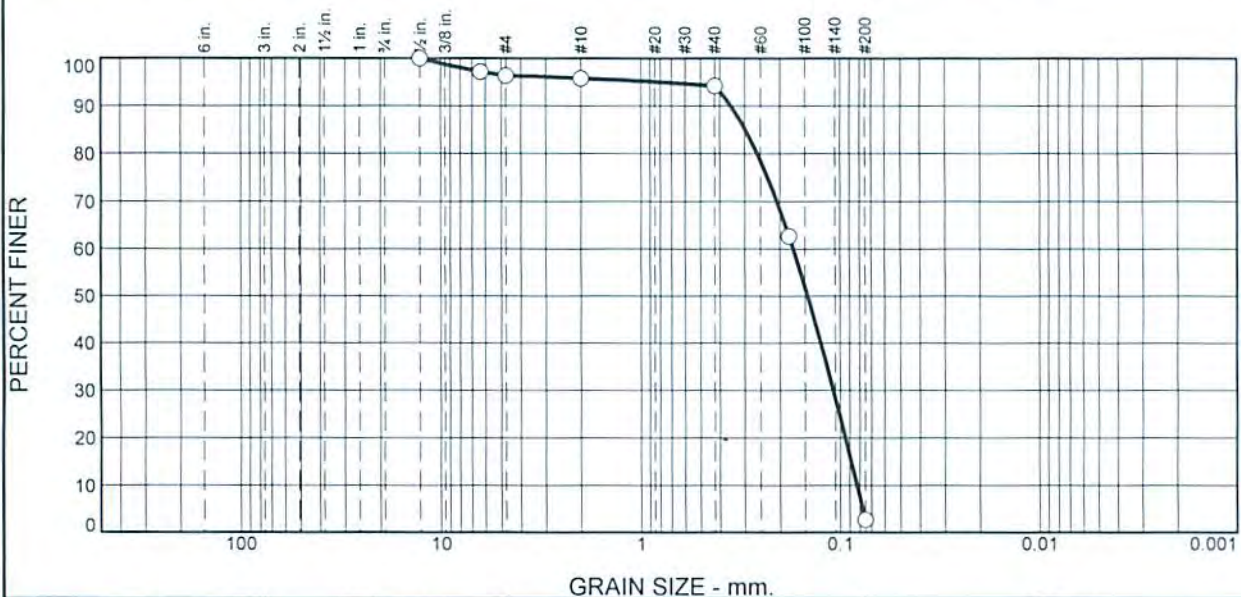
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B04; S-5 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 8-10'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	0	2	91	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
1/4"	97		
#4	96		
#10	96		
#40	94		
#80	63		
#200	2.7		

Soil Description

PL= -- Atterberg Limits LL= -- PI= --

Coefficients
D₈₅= 0.2979 D₆₀= 0.1715 D₅₀= 0.1455
D₃₀= 0.1085 D₁₅= 0.0884 D₁₀= 0.0826
C_u= 2.08 C_c= 0.83

USCS= SP Classification AASHTO=

Remarks
Moisture Content = 21.6%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judy Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-04-10-15

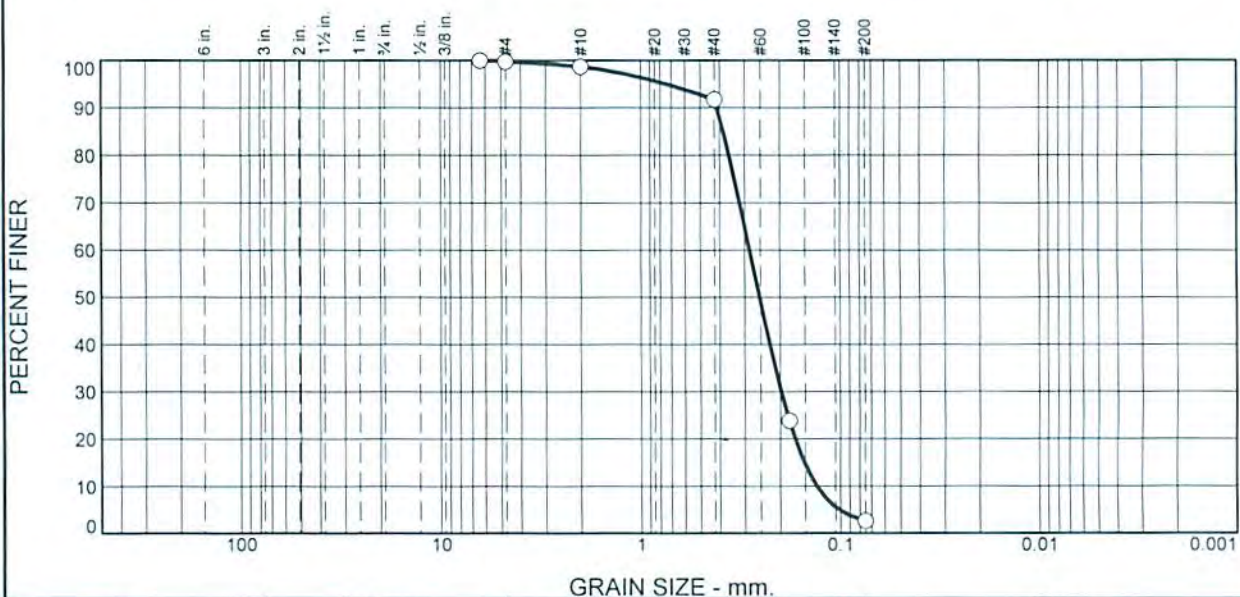
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B05; S-2 Source of Sample: Boring Sample

Location: In-place

Elev./Depth: 2-4'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	7	89	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/4"	100		
#4	100		
#10	99		
#40	92		
#80	24		
#200	2.7		

Soil Description

PL= -- Atterberg Limits LL= -- PI= --

Coefficients
D₈₅= 0.3842 D₆₀= 0.2835 D₅₀= 0.2530
D₃₀= 0.1976 D₁₅= 0.1514 D₁₀= 0.1310
C_u= 2.16 C_c= 1.05

USCS= SP Classification AASHTO=

Remarks
Moisture Content = 28.7%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by:

Judith Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-05-10-15

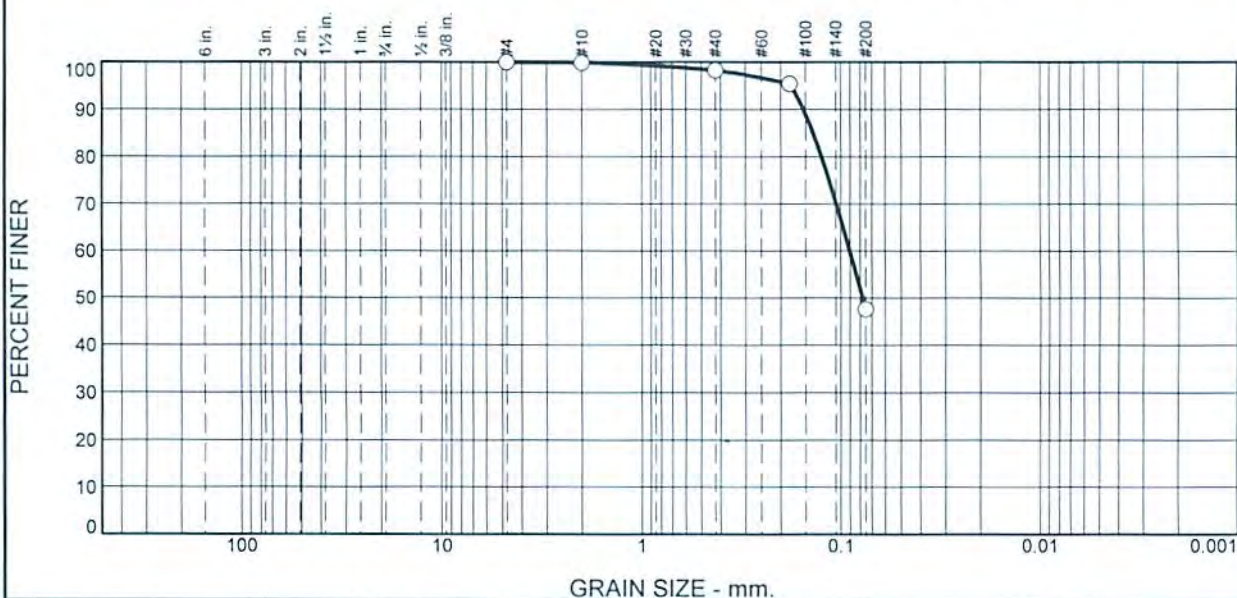
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B05; S-3 Source of Sample: Boring Sample

Location: In-place

Elev./Depth: 4-6'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	50	48	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	98		
#80	95		
#200	48		

Soil Description

PL= -- Atterberg Limits LL= -- PI= --

Coefficients
D₈₅= 0.1375 D₆₀= 0.0901 D₅₀= 0.0777
D₃₀= D₁₅= D₁₀=
C_u= C_c=

USCS= Classification AASHTO=

Remarks
Moisture Content = 26.5%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judith Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-06-10-15

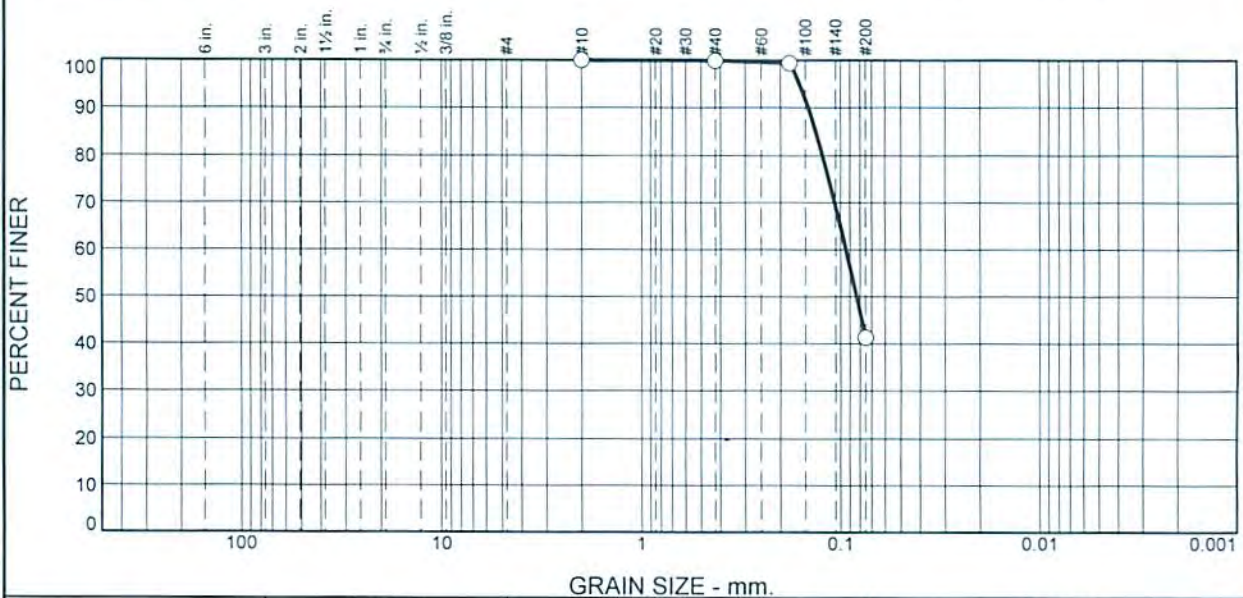
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B05; S-6A Source of Sample: Boring Sample

Location: In-place

Elev./Depth: 10.5-11'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	59	41	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#10	100		
#40	100		
#80	99		
#200	41		

* (no specification provided)

Soil Description

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 0.1331 D₆₀= 0.0941 D₅₀= 0.0832
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content = 21.0%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judy Ames

Date: 11/9/15



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Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-07-10-15

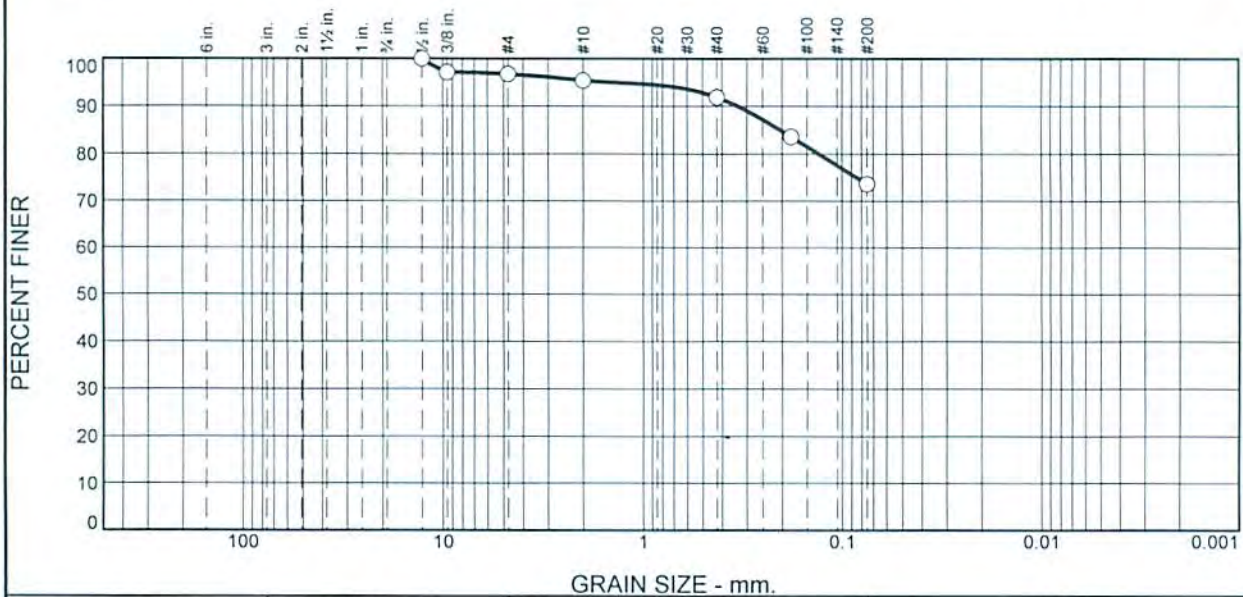
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B05; S-6B **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 11-12'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	3	2	3	18	74	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
3/8"	97		
#4	97		
#10	95		
#40	92		
#80	84		
#200	74		

Soil Description

PL= 15 **Atterberg Limits** LL= 44 PI= 29

Coefficients
D₈₅= 0.2042 D₆₀=
D₃₀= D₁₅=
C_u= C_c=

Classification
USCS= CL AASHTO= A-7-6(20)

Remarks
Moisture Content = 26.7%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judith Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

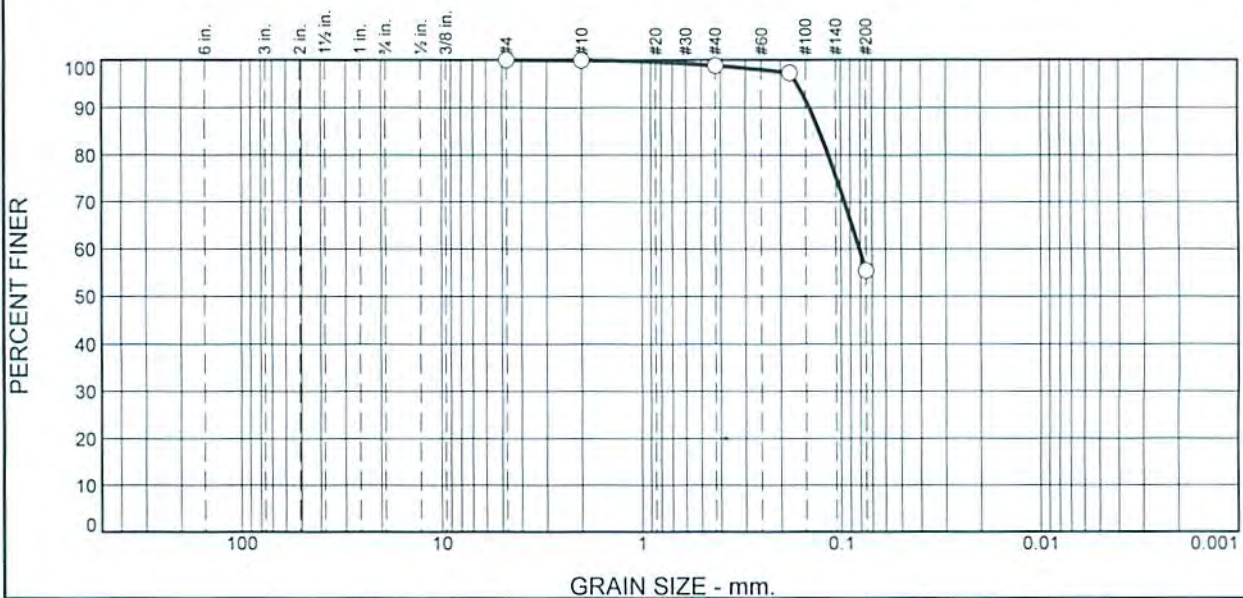
Report No.: CD7311SL-08-10-15

Client: Arcadis

Date: 10/29/15

Sample No: AUS-B06; S-4 Source of Sample: Boring Sample
Location: In-place

Elev./Depth: 6-8'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	44	55	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	99		
#80	97		
#200	55		

* (no specification provided)

Soil Description

PL= -- Atterberg Limits LL= -- PI= --

Coefficients
D₈₅= 0.1278 D₆₀= 0.0809 D₅₀=
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification
USCS= AASHTO=

Remarks
Moisture Content = 27.3%

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judith Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-09-10-15

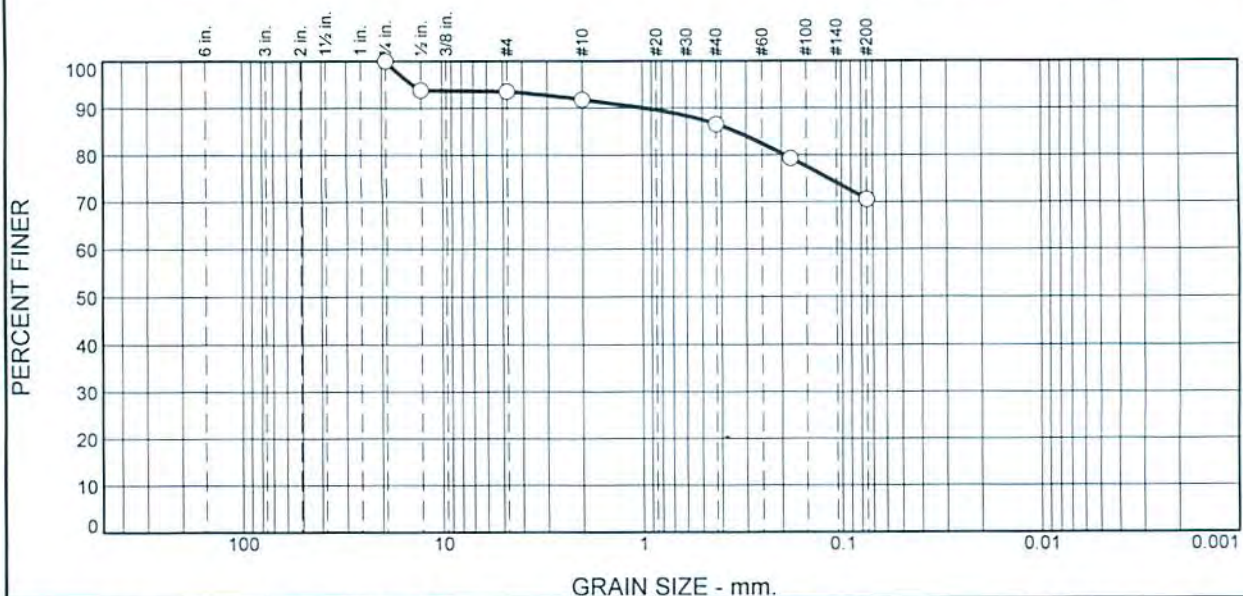
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B06; S-6A **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 12-12.3'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	2	5	16	71	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
3/4"	100		
1/2"	94		
#4	94		
#10	92		
#40	87		
#80	79		
#200	71		

* (no specification provided)

Soil Description

PL= 13 **Atterberg Limits** LL= 39 PI= 26

Coefficients
D₈₅= 0.3391 D₆₀= D₅₀=
D₃₀= D₁₅= D₁₀=
C_u= C_c=

USCS= CL **Classification** AASHTO= A-6(16)

Remarks
Moisture Content = 32.5%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judith Ames

Date: 11/9/15



Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-10-10-15

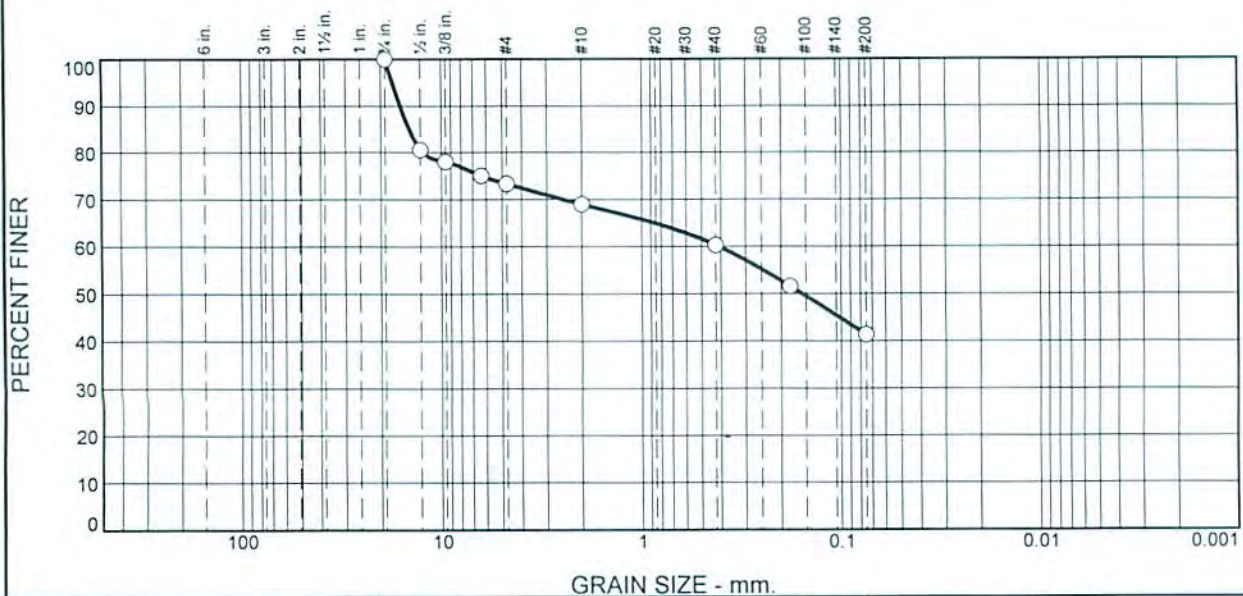
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B06; S-6B **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 12.3-12.9'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	27	4	9	19	41	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
3/4"	100		
1/2"	81		
3/8"	78		
1/4"	75		
#4	73		
#10	69		
#40	60		
#80	52		
#200	41		

Soil Description

Atterberg Limits
 PL= 13 LL= 21 PI= 8
Coefficients
 D₈₅= 14.4414 D₆₀= 0.4106 D₅₀= 0.1567
 D₃₀= D₁₅= D₁₀=
 C_u= C_c=
Classification
 USCS= SC AASHTO= A-4(0)
Remarks
 Moisture Content = 9.5%

* (no specification provided)

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judith Ames

Date: 11/9/15



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Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-11-10-15

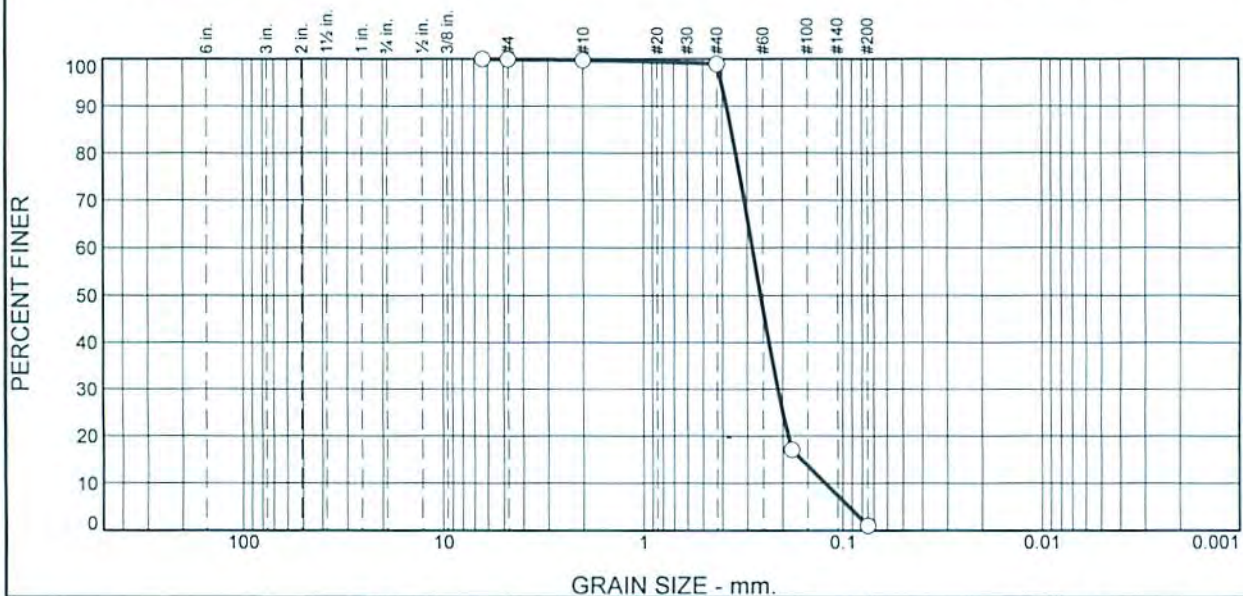
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B07; S-2 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 2-4'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	98	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/4"	100		
#4	100		
#10	100		
#40	99		
#80	17		
#200	1.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 0.3601 D₆₀= 0.2826 D₅₀= 0.2574
D₃₀= 0.2110 D₁₅= 0.1609 D₁₀= 0.1224
C_u= 2.31 C_c= 1.29

Classification

USCS= SP AASHTO=

Remarks

Moisture Content = 28.5%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judy Ames

Date: 11/9/15



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Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-12-10-15

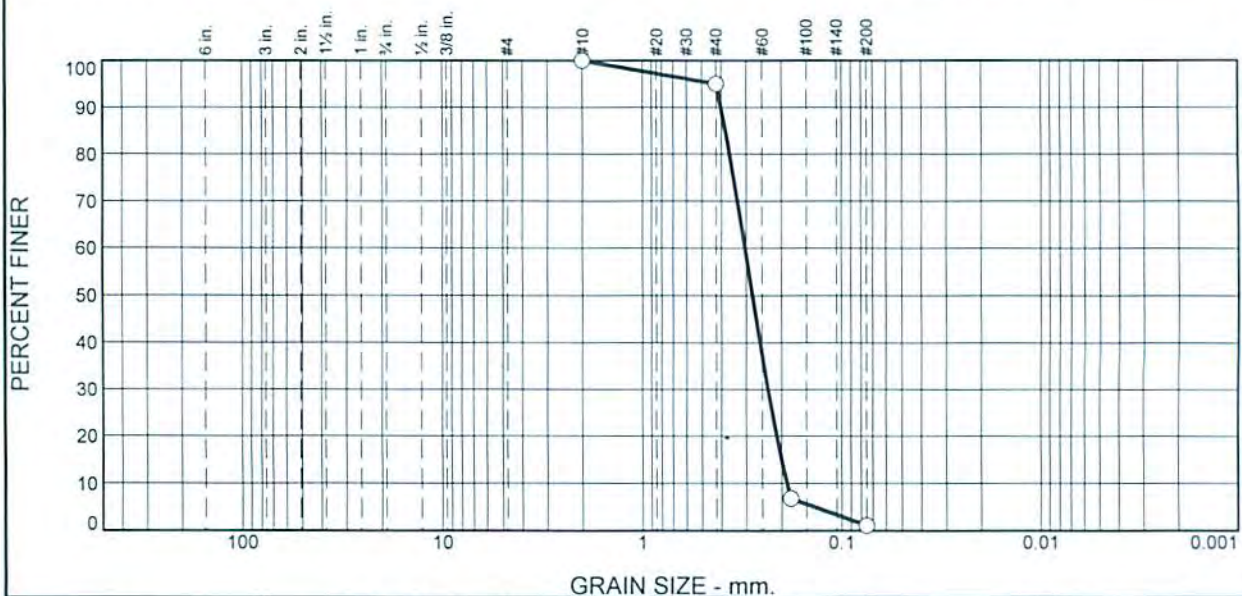
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B07; S-3 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 4-6'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	5	94	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#10	100		
#40	95		
#80	7		
#200	1.1		

* (no specification provided)

Soil Description

Atterberg Limits
 PL= -- LL= -- PI= --
Coefficients
 D₈₅= 0.3819 D₆₀= 0.3045 D₅₀= 0.2794
 D₃₀= 0.2337 D₁₅= 0.2002 D₁₀= 0.1882
 C_u= 1.62 C_c= 0.95
Classification
 USCS= SP AASHTO=
Remarks
 Moisture Content = 24.7%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Judith Ames

Date: 11/9/15



Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-13-10-15

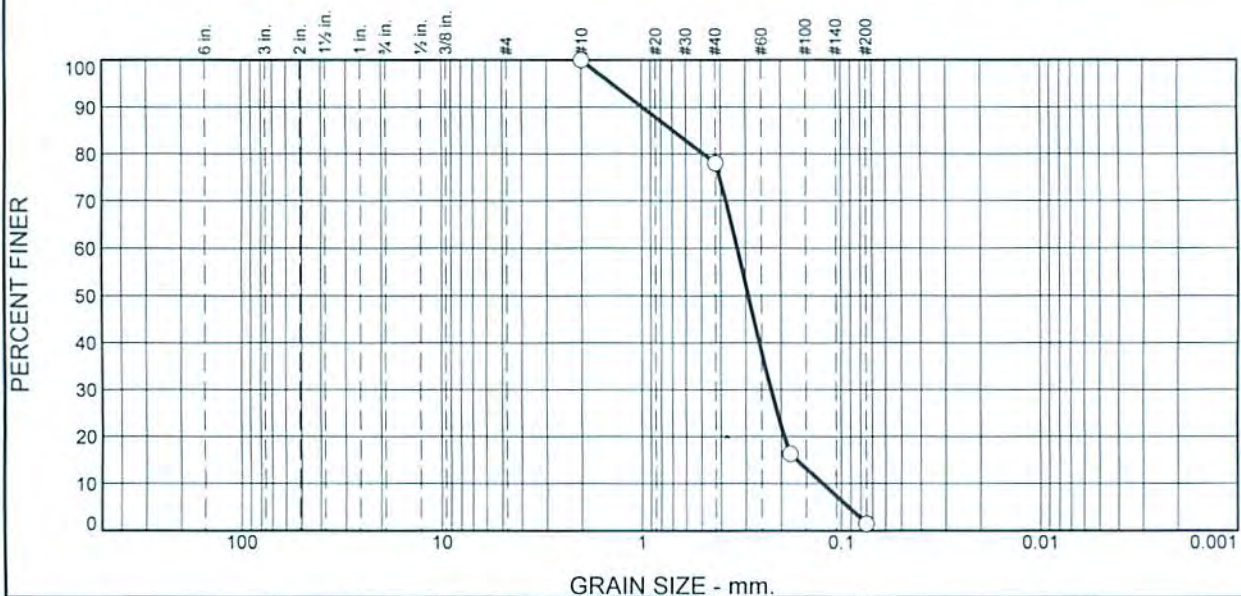
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B07; S-6 **Source of Sample:** Boring Sample

Location: In-place

Elev./Depth: 10-12'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	22	77	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#10	100		
#40	78		
#80	16		
#200	1.5		

* (no specification provided)

Soil Description

PL= -- **Atterberg Limits** LL= -- PI= --

Coefficients
D₈₅= 0.6958 D₆₀= 0.3302 D₅₀= 0.2909
D₃₀= 0.2243 D₁₅= 0.1669 D₁₀= 0.1241
C_u= 2.66 C_c= 1.23

USCS= SP **Classification** AASHTO=

Remarks
Moisture Content = 18.5%

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judge Ames

Date: 11/9/15



WBE certified company

Particle Size Distribution Report

Project: Manistique River AOC

Report No.: CD7311SL-14-10-15

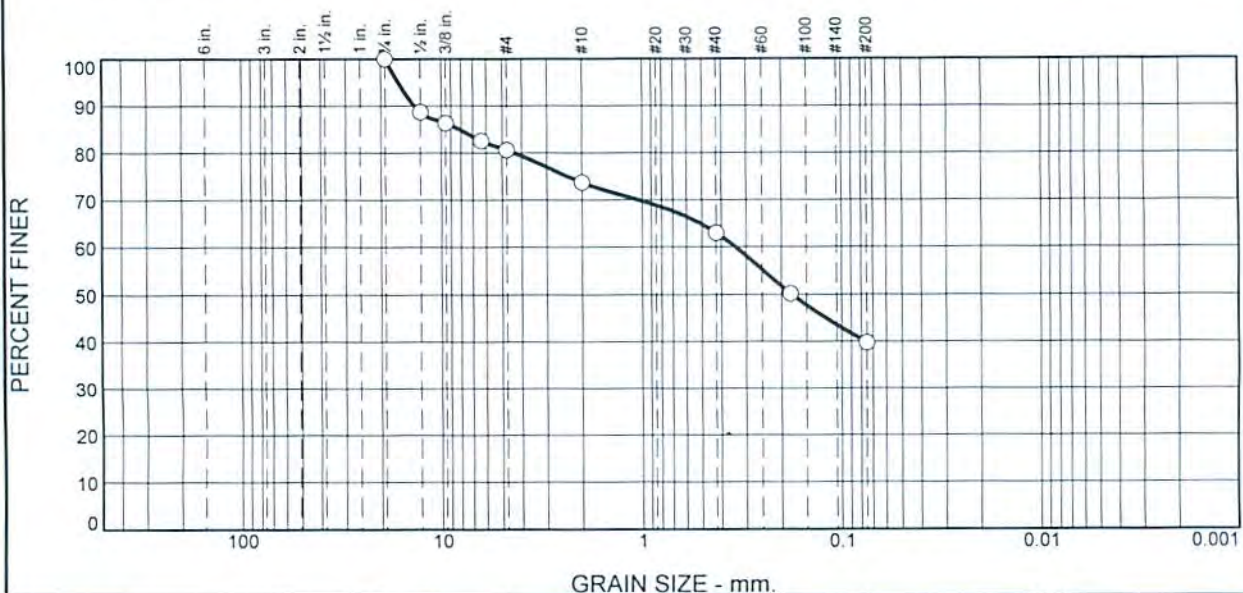
Client: Arcadis

Date: 10/29/15

Sample No: AUS-B07; S-7 Source of Sample: Boring Sample

Location: In-place

Elev./Depth: 12-12.8'



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	19	7	11	23	40	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
3/4"	100		
1/2"	89		
3/8"	86		
1/4"	83		
#4	81		
#10	74		
#40	63		
#80	50		
#200	40		

* (no specification provided)

Soil Description

PL= -- Atterberg Limits LL= -- PI= --
 Coefficients
 D₈₅= 8.1446 D₆₀= 0.3406 D₅₀= 0.1773
 D₃₀= D₁₅= D₁₀=
 C_u= C_c=
Classification
 USCS= AASHTO=
Remarks
 Moisture Content = 10.3%

ATLANTIC TESTING LABORATORIES, LIMITED

Figure

Reviewed by: Judge Ames

Date: 11/9/15

Bulk Sediment Sampling Data



**WORK ORDER NUMBER: 15-10-1267***The difference is service*

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For**Client:** ARCADIS U.S., Inc.**Client Project Name:** Mantinique DRET / ETT**Attention:** Sarah Greenfield
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

A handwritten signature in black ink, appearing to read "Carla Hollowell".

Approved for release on 11/05/2015 by:
Carla Hollowell
Project Manager

ResultLink ▶

Email your PM ▶



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Contents

Client Project Name: Mantinique DRET / ETT
 Work Order Number: 15-10-1267

1	Work Order Narrative.	3
2	Sample Summary.	4
3	Client Sample Data.	5
	3.1 SM 2540 D Total Suspended Solids (Aqueous).	5
	3.2 SM 4500 H+ B pH (Aqueous).	7
	3.3 SM 4500-O G Dissolved Oxygen (Aqueous).	8
	3.4 SM 5310 D Total Organic Carbon (Aqueous).	9
	3.5 EPA 8082 PCB Aroclors (Aqueous).	11
4	Quality Control Sample Data.	16
	4.1 MS/MSD.	16
	4.2 Sample Duplicate.	18
	4.3 LCS/LCSD.	24
5	Glossary of Terms and Qualifiers.	29
6	Chain-of-Custody/Sample Receipt Form.	30

Work Order Narrative

Work Order: 15-10-1267

Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 10/22/15. They were assigned to Work Order 15-10-1267.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of ≤ 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.



Calscience

Sample Summary

Client: ARCADIS U.S., Inc.	Work Order: 15-10-1267
10559 Citation Drive, Suite 100	Project Name: Mantinique DRET / ETT
Brighton, MI 48116-8382	PO Number:
	Date/Time Received: 10/22/15 17:15
	Number of Containers: 40

Attn: Sarah Greenfield

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
AUS-TS04 (DRET)	15-10-1267-1	10/21/15 12:00	5	Aqueous
AUS-TS03 (DRET)	15-10-1267-2	10/21/15 13:00	5	Aqueous
AUS-TS01 (DRET)	15-10-1267-3	10/21/15 14:05	5	Aqueous
AUS-TS02 (DRET)	15-10-1267-4	10/21/15 14:40	5	Aqueous
AUS-TS04 (EET)	15-10-1267-5	10/21/15 13:30	5	Aqueous
AUS-TS03 (EET)	15-10-1267-6	10/22/15 14:00	5	Aqueous
AUS-TS01 (EET)	15-10-1267-7	10/21/15 19:00	5	Aqueous
AUS-TS02 (EET)	15-10-1267-8	10/22/15 13:00	5	Aqueous


Return to Contents



Calscience

Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D
Units: mg/L

Project: Mantinique DRET / ETT

Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (DRET)	15-10-1267-1-E	10/21/15 12:00	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		60	1.0		1.00		
AUS-TS03 (DRET)	15-10-1267-2-E	10/21/15 13:00	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		52	1.0		1.00		
AUS-TS01 (DRET)	15-10-1267-3-E	10/21/15 14:05	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		46	1.0		1.00		
AUS-TS02 (DRET)	15-10-1267-4-E	10/21/15 14:40	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		36	1.0		1.00		
AUS-TS04 (EET)	15-10-1267-5-E	10/21/15 13:30	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		45	1.0		1.00		
AUS-TS03 (EET)	15-10-1267-6-C	10/22/15 14:00	Aqueous	N/A	10/23/15	10/23/15 19:00	F1023TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		ND	1.0		1.00		
AUS-TS01 (EET)	15-10-1267-7-E	10/21/15 19:00	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		7.1	1.0		1.00		
AUS-TS02 (EET)	15-10-1267-8-E	10/22/15 13:00	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Solids, Total Suspended		27	1.0		1.00		

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D
Units: mg/L

Project: Martinique DRET / ETT

Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	099-09-010-7372	N/A	Aqueous	N/A	10/23/15	10/23/15 19:00	F1023TSSL1

<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Solids, Total Suspended	ND	1.0	1.00	

Method Blank	099-09-010-7375	N/A	Aqueous	N/A	10/27/15	10/27/15 15:00	F1027TSSL1
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<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Solids, Total Suspended	ND	1.0	1.00	

[Return to Contents](#)

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500 H+ B
Units: pH units

Project: Mantinique DRET / ETT

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (DRET)	15-10-1267-1-A	10/21/15 12:00	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.73	0.01		1.00		BV
AUS-TS03 (DRET)	15-10-1267-2-A	10/21/15 13:00	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.59	0.01		1.00		BV
AUS-TS01 (DRET)	15-10-1267-3-A	10/21/15 14:05	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.58	0.01		1.00		BV
AUS-TS02 (DRET)	15-10-1267-4-A	10/21/15 14:40	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.51	0.01		1.00		BV
AUS-TS04 (EET)	15-10-1267-5-A	10/21/15 13:30	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.46	0.01		1.00		BV
AUS-TS03 (EET)	15-10-1267-6-A	10/22/15 14:00	Aqueous	PH 1	N/A	10/22/15 19:23	F1022PHD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		6.79	0.01		1.00		BV,BU
AUS-TS01 (EET)	15-10-1267-7-A	10/21/15 19:00	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		7.25	0.01		1.00		BV
AUS-TS02 (EET)	15-10-1267-8-A	10/22/15 13:00	Aqueous	PH 1	N/A	10/22/15 19:23	F1022PHD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
pH		6.73	0.01		1.00		BV,BU

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500-O G
Units: mg/L

Project: Mantinique DRET / ETT

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (DRET)	15-10-1267-1-C	10/21/15 12:00	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		7.72	0.0100		1.00		BV,BU
AUS-TS03 (DRET)	15-10-1267-2-C	10/21/15 13:00	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		7.59	0.0100		1.00		BV,BU
AUS-TS01 (DRET)	15-10-1267-3-C	10/21/15 14:05	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		7.16	0.0100		1.00		BV,BU
AUS-TS02 (DRET)	15-10-1267-4-C	10/21/15 14:40	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		6.62	0.0100		1.00		BV,BU
AUS-TS04 (EET)	15-10-1267-5-C	10/21/15 13:30	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		6.84	0.0100		1.00		BV,BU
AUS-TS03 (EET)	15-10-1267-6-C	10/22/15 14:00	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		9.35	0.0100		1.00		BV
AUS-TS01 (EET)	15-10-1267-7-C	10/21/15 19:00	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		5.58	0.0100		1.00		BV,BU
AUS-TS02 (EET)	15-10-1267-8-D	10/22/15 13:00	Aqueous	BOD 1	N/A	10/22/15 16:10	F1022DOD1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Dissolved Oxygen		8.05	0.0100		1.00		BV,BU

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D
Units: mg/L

Project: Mantinique DRET / ETT

Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (DRET)	15-10-1267-1-B	10/21/15 12:00	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		10	5.0		10.0		
AUS-TS03 (DRET)	15-10-1267-2-B	10/21/15 13:00	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		11	5.0		10.0		
AUS-TS01 (DRET)	15-10-1267-3-B	10/21/15 14:05	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		13	5.0		10.0		
AUS-TS02 (DRET)	15-10-1267-4-B	10/21/15 14:40	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		12	5.0		10.0		
AUS-TS04 (EET)	15-10-1267-5-B	10/21/15 13:30	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		12	5.0		10.0		
AUS-TS03 (EET)	15-10-1267-6-B	10/22/15 14:00	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCL1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		15	5.0		10.0		
AUS-TS01 (EET)	15-10-1267-7-B	10/21/15 19:00	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		41	5.0		10.0		
AUS-TS02 (EET)	15-10-1267-8-B	10/22/15 13:00	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Carbon, Total Organic		18	5.0		10.0		

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D
Units: mg/L

Project: Martinique DRET / ETT

Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	099-16-724-24	N/A	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCL1

Parameter	Result	RL	DF	Qualifiers
Carbon, Total Organic	ND	0.50	1.00	

Method Blank	099-16-724-25	N/A	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3
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Parameter	Result	RL	DF	Qualifiers
Carbon, Total Organic	ND	0.50	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082
Units: ug/L

Project: Mantinique DRET / ETT

Page 1 of 5

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (DRET)	15-10-1267-1-D	10/21/15 12:00	Aqueous	GC 66	10/28/15	10/28/15 17:22	151028L07

<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	ND	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	77	50-135	
2,4,5,6-Tetrachloro-m-Xylene	80	50-135	

AUS-TS03 (DRET)	15-10-1267-2-D	10/21/15 13:00	Aqueous	GC 66	10/28/15	10/28/15 17:40	151028L07
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<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	0.66	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	68	50-135	
2,4,5,6-Tetrachloro-m-Xylene	69	50-135	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082
Units: ug/L

Project: Mantinique DRET / ETT

Page 2 of 5

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS01 (DRET)	15-10-1267-3-D	10/21/15 14:05	Aqueous	GC 66	10/28/15	10/28/15 18:24	151028L07

<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	ND	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	68	50-135	
2,4,5,6-Tetrachloro-m-Xylene	67	50-135	

AUS-TS02 (DRET)	15-10-1267-4-D	10/21/15 14:40	Aqueous	GC 66	10/28/15	10/28/15 18:42	151028L07
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<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	1.9	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	73	50-135	
2,4,5,6-Tetrachloro-m-Xylene	69	50-135	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082
Units: ug/L

Project: Mantinique DRET / ETT

Page 3 of 5

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04 (EET)	15-10-1267-5-D	10/21/15 13:30	Aqueous	GC 66	10/28/15	10/28/15 19:00	151028L07

<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	0.97	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	71	50-135	
2,4,5,6-Tetrachloro-m-Xylene	69	50-135	

AUS-TS03 (EET)	15-10-1267-6-C	10/22/15 14:00	Aqueous	GC 66	10/28/15	10/28/15 19:17	151028L07
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<u>Parameter</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Qualifiers</u>
Aroclor-1016	ND	0.50	1.00	
Aroclor-1221	ND	0.50	1.00	
Aroclor-1232	ND	0.50	1.00	
Aroclor-1242	ND	0.50	1.00	
Aroclor-1248	1.0	0.50	1.00	
Aroclor-1254	ND	0.50	1.00	
Aroclor-1260	ND	0.50	1.00	
Aroclor-1262	ND	0.50	1.00	

<u>Surrogate</u>	<u>Rec. (%)</u>	<u>Control Limits</u>	<u>Qualifiers</u>
Decachlorobiphenyl	74	50-135	
2,4,5,6-Tetrachloro-m-Xylene	73	50-135	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



Calscience

Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082
Units: ug/L

Project: Mantinique DRET / ETT

Page 4 of 5

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS01 (EET)	15-10-1267-7-D	10/21/15 19:00	Aqueous	GC 66	10/28/15	10/28/15 19:35	151028L07

Parameter	Result	RL	DF	Qualifiers
Aroclor-1016	ND	0.48	1.00	
Aroclor-1221	ND	0.48	1.00	
Aroclor-1232	ND	0.48	1.00	
Aroclor-1242	ND	0.48	1.00	
Aroclor-1248	0.57	0.48	1.00	
Aroclor-1254	ND	0.48	1.00	
Aroclor-1260	ND	0.48	1.00	
Aroclor-1262	ND	0.48	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Decachlorobiphenyl	56	50-135	
2,4,5,6-Tetrachloro-m-Xylene	53	50-135	

AUS-TS02 (EET)	15-10-1267-8-D	10/22/15 13:00	Aqueous	GC 66	10/28/15	10/28/15 19:53	151028L07
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Parameter	Result	RL	DF	Qualifiers
Aroclor-1016	ND	0.50	1.00	
Aroclor-1221	ND	0.50	1.00	
Aroclor-1232	ND	0.50	1.00	
Aroclor-1242	ND	0.50	1.00	
Aroclor-1248	3.6	0.50	1.00	
Aroclor-1254	ND	0.50	1.00	
Aroclor-1260	ND	0.50	1.00	
Aroclor-1262	ND	0.50	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Decachlorobiphenyl	77	50-135	
2,4,5,6-Tetrachloro-m-Xylene	72	50-135	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



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Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082
Units: ug/L

Project: Martinique DRET / ETT

Page 5 of 5

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	099-16-104-14	N/A	Aqueous	GC 66	10/28/15	10/28/15 17:04	151028L07

Parameter	Result	RL	DF	Qualifiers
Aroclor-1016	ND	0.50	1.00	
Aroclor-1221	ND	0.50	1.00	
Aroclor-1232	ND	0.50	1.00	
Aroclor-1242	ND	0.50	1.00	
Aroclor-1248	ND	0.50	1.00	
Aroclor-1254	ND	0.50	1.00	
Aroclor-1260	ND	0.50	1.00	
Aroclor-1262	ND	0.50	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Decachlorobiphenyl	70	50-135	
2,4,5,6-Tetrachloro-m-Xylene	69	50-135	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.



Calscience

Quality Control - Spike/Spike Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D

Project: Mantinique DRET / ETT

Page 1 of 2

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
15-10-1706-3	Sample	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCS1
15-10-1706-3	Matrix Spike	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCS1
15-10-1706-3	Matrix Spike Duplicate	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCS1

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	3.350	10.00	13.60	102	13.60	102	31-145	0	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Spike/Spike Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D

Project: Mantinique DRET / ETT

Page 2 of 2

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number				
AUS-TS04 (DRET)	Sample	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCS3				
AUS-TS04 (DRET)	Matrix Spike	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCS3				
AUS-TS04 (DRET)	Matrix Spike Duplicate	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCS3				
Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	10.40	100.0	110.0	100	112.0	102	31-145	2	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D

Project: Mantinique DRET / ETT

Page 1 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
15-10-1436-1	Sample	Aqueous	N/A	10/23/15 00:00	10/23/15 19:00	F1023TSSD1
15-10-1436-1	Sample Duplicate	Aqueous	N/A	10/23/15 00:00	10/23/15 19:00	F1023TSSD1

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Solids, Total Suspended	44.50	42.00	6	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D

Project: Mantinique DRET / ETT

Page 2 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
15-10-1523-2	Sample	Aqueous	N/A	10/27/15 00:00	10/27/15 15:00	F1027TSSD1
15-10-1523-2	Sample Duplicate	Aqueous	N/A	10/27/15 00:00	10/27/15 15:00	F1027TSSD1

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Solids, Total Suspended	712.0	704.0	1	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500 H+ B

Project: Mantinique DRET / ETT

Page 3 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
15-10-1483-3	Sample	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3
15-10-1483-3	Sample Duplicate	Aqueous	PH 1	N/A	10/21/15 19:31	F1021PHD3

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
pH	7.690	7.680	0	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500 H+ B

Project: Mantinique DRET / ETT

Page 4 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
15-10-1624-1	Sample	Aqueous	PH 1	N/A	10/22/15 19:23	F1022PHD1
15-10-1624-1	Sample Duplicate	Aqueous	PH 1	N/A	10/22/15 19:23	F1022PHD1

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
pH	8.170	8.180	0	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500-O G

Project: Mantinique DRET / ETT

Page 5 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
AUS-TS04 (DRET)	Sample	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
AUS-TS04 (DRET)	Sample Duplicate	Aqueous	BOD 1	N/A	10/21/15 20:30	F1021DOD1
<u>Parameter</u>		<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Dissolved Oxygen		7.720	7.770	1	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 4500-O G

Project: Mantinique DRET / ETT

Page 6 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
15-10-1657-1	Sample	Aqueous	BOD 1	N/A	10/22/15 16:10	F1022DOD1
15-10-1657-1	Sample Duplicate	Aqueous	BOD 1	N/A	10/22/15 16:10	F1022DOD1

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Dissolved Oxygen	7.190	7.020	2	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - LCS/LCSD

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D

Project: Mantinique DRET / ETT

Page 1 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number			
099-09-010-7372	LCS	Aqueous	N/A	10/23/15	10/23/15 19:00	F1023TSSL1			
099-09-010-7372	LCSD	Aqueous	N/A	10/23/15	10/23/15 19:00	F1023TSSL1			
<u>Parameter</u>	<u>Spike Added</u>	<u>LCS Conc.</u>	<u>LCS %Rec.</u>	<u>LCSD Conc.</u>	<u>LCSD %Rec.</u>	<u>%Rec. CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Solids, Total Suspended	100.0	102.0	102	104.0	104	80-120	2	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - LCS/LCSD

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 2540 D

Project: Mantinique DRET / ETT

Page 2 of 5

Quality Control Sample ID	Type	Matrix		Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number			
099-09-010-7375	LCS	Aqueous		N/A	10/27/15	10/27/15 15:00	F1027TSSL1			
099-09-010-7375	LCSD	Aqueous		N/A	10/27/15	10/27/15 15:00	F1027TSSL1			
<u>Parameter</u>	<u>Spike Added</u>	<u>LCS</u>	<u>Conc.</u>	<u>LCS</u> <u>%Rec.</u>	<u>LCSD Conc.</u>	<u>LCSD</u> <u>%Rec.</u>	<u>%Rec. CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Solids, Total Suspended	100.0	105.0		105	106.0	106	80-120	1	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - LCS/LCSD

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D

Project: Mantinique DRET / ETT

Page 3 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number			
099-16-724-24	LCS	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCL1			
099-16-724-24	LCSD	Aqueous	TOC 6	10/24/15	10/24/15 19:54	F1024TOCL1			
<u>Parameter</u>	<u>Spike Added</u>	<u>LCS Conc.</u>	<u>LCS %Rec.</u>	<u>LCSD Conc.</u>	<u>LCSD %Rec.</u>	<u>%Rec. CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Carbon, Total Organic	10.00	9.930	99	9.960	100	80-120	0	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - LCS/LCSD

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: N/A
Method: SM 5310 D

Project: Mantinique DRET / ETT

Page 4 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number			
099-16-724-25	LCS	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3			
099-16-724-25	LCSD	Aqueous	TOC 6	10/28/15	10/29/15 07:14	F1028TOCL3			
<u>Parameter</u>	<u>Spike Added</u>	<u>LCS Conc.</u>	<u>LCS %Rec.</u>	<u>LCSD Conc.</u>	<u>LCSD %Rec.</u>	<u>%Rec. CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Carbon, Total Organic	10.00	10.40	104	10.50	105	80-120	1	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits



Calscience

Quality Control - LCS/LCSD

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/22/15
Work Order: 15-10-1267
Preparation: EPA 3510C
Method: EPA 8082

Project: Mantinique DRET / ETT

Page 5 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number			
099-16-104-14	LCS	Aqueous	GC 66	10/28/15	10/28/15 16:46	151028L07			
099-16-104-14	LCSD	Aqueous	GC 66	10/28/15	10/28/15 16:46	151028L07			
Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Aroclor-1260	1.000	0.8201	82	0.8201	82	50-135	0	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Glossary of Terms and Qualifiers

Work Order: 15-10-1267

Page 1 of 1

<u>Qualifiers</u>	<u>Definition</u>
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

7440 Lincoln Way, Garden Grove, CA 92641-1427 • (714) 895-5494
For courier service / sample drop off information, contact us26_sales@eurofinsus.com or call us

LABORATORY CLIENT:

ARCADIS

111 SW COLUMBIA ST, #670

CITY: **PORTLAND**

STATE: OR ZIP: 97201

TEL: _____ E-MAIL: _____

TURNAROUND TIME (Rush surcharges may apply to any TAT not "STANDARD"):

☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ✖ STANDARD

GLOBAL ID:

LOG CODE:

SPECIAL INSTRUCTIONS:

[illegible]

Relinquished by: (Signature)

Damage

Received by: (Signature/Affiliation)

Relinquished by: (Signature)

Received by: (Signature/Affiliation)

5

Date: 1/1 Time:

Relinquished by: (Signature)

Received by: (Signature/Affiliation)

Date: _____

Time:

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 2

CLIENT: Arcadis

DATE: 10/21/2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF: -0.4°C); Temperature (w/o CF): 2.7 °C (w/ CF): 2.3 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by:)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: 619

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: 659

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: 965

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers			
<input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input checked="" type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input checked="" type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input checked="" type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number:)

Aqueous: ☐ VOA ☐ VOA_h ☐ VOA_{na2} ☐ 100PJ ☐ 100PJ_{na2} ☐ 125AGB ☐ 125AGB_h ☐ 125AGB_p ☒ 125PB

☐ 125PB_{znna} ☐ 250AGB ☐ 250CGB ☒ 250CGB_s ☐ 250PB ☐ 250PB_n ☒ 500AGB ☐ 500AGJ ☐ 500AGJ_s
☐ 500PB ☒ 1AGB ☐ 1AGB_{na2} ☐ 1AGB_s ☒ 1PB ☐ 1PB_{na} ☐ ☐ ☐ ☐ ☐

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve () ☐ EnCores® () ☐ TerraCores® () ☐

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ Other Matrix (): ☐ ☐

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: 965

s = H₂SO₄, u = ultra-pure, znna = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: 695

SAMPLE RECEIPT CHECKLIST

COOLER 2 OF 2

CLIENT: Arcadi's

DATE: 10 / 22 / 2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF: -0.4°C); Temperature (w/o CF): 3.4 °C (w/ CF): 3.0 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: 659

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: 659

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: 965

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers			
<input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input checked="" type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input checked="" type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input checked="" type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOA_h ☐ VOA_{na2} ☐ 100PJ ☐ 100PJ_{na2} ☐ 125AGB ☐ 125AGB_h ☐ 125AGB_p ☒ 125PB

☐ 125PB_{znna} ☐ 250AGB ☐ 250CGB ☒ 250CGB_s ☐ 250PB ☐ 250PB_n ☒ 500AGB ☐ 500AGJ ☐ 500AGJ_s
☐ 500PB ☒ 1AGB ☐ 1AGB_{na2} ☐ 1AGB_s ☒ 1PB ☐ 1PB_{na} ☐ _____ ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____) ☐ _____ ☐ _____

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: 965

s = H₂SO₄, u = ultra-pure, znna = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: 659

SAMPLE ANOMALY REPORT

DATE: 10 / 22 / 2015

SAMPLES, CONTAINERS, AND LABELS:

- ☐ Sample(s) NOT RECEIVED but listed on COC
- ☐ Sample(s) received but NOT LISTED on COC
- ☐ Holding time expired (list client or ECI sample ID and analysis)
- ☒ Insufficient sample amount for requested analysis (list analysis)
- ☐ Improper container(s) used (list analysis)
- ☐ Improper preservative used (list analysis)
- ☐ No preservative noted on COC or label (list analysis and notify lab)
- ☐ Sample container(s) not labeled
- ☐ Client sample label(s) illegible (list container type and analysis)
- ☐ Client sample label(s) do not match COC (comment)
 - ☐ Project information
 - ☐ Client sample ID
 - ☐ Sampling date and/or time
 - ☐ Number of container(s)
 - ☐ Requested analysis
- ☐ Sample container(s) compromised (comment)
 - ☐ Broken
 - ☐ Water present in sample container
- ☐ Air sample container(s) compromised (comment)
 - ☐ Flat
 - ☐ Very low in volume
 - ☐ Leaking (not transferred; duplicate bag submitted)
 - ☐ Leaking (transferred into ECI Tedlar™ bags*)
 - ☐ Leaking (transferred into client's Tedlar™ bags*)

* Transferred at client's request.

MISCELLANEOUS: (Describe)

HEADSPACE:

(Containers with bubble > 6 mm or ¼ inch for volatile organic or dissolved gas analysis)

ECI Sample ID	ECI Container ID	Total Number**	ECI Sample ID	ECI Container ID	Total Number**

Comments: _____

** Record the total number of containers (i.e., vials or bottles) for the affected sample.

Comments

(-6) Limited samples created.
Insufficient sample to run
Dissolved Oxygen.

Comments

(Containers with bubble for other analysis)

ECI Sample ID	ECI Container ID	Total Number**	Requested Analysis

Reported by: 965

Reviewed by: 659

**WORK ORDER NUMBER: 15-10-1093***The difference is service*

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For**Client:** ARCADIS U.S., Inc.**Client Project Name:** B0038001.0001.00016**Attention:** Sarah Greenfield
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

A handwritten signature in black ink, appearing to read "Carla Hollowell".

Approved for release on 11/05/2015 by:
Carla Hollowell
Project Manager

ResultLink ▶

Email your PM ▶



Eurofins Calscience, Inc. (Calscience) certifies that the test results provided in this report meet all NELAC requirements for parameters for which accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

Contents

Client Project Name: B0038001.0001.00016
 Work Order Number: 15-10-1093

1	Work Order Narrative.	3
2	Sample Summary.	4
3	Client Sample Data.	5
	3.1 ASTM D-2216 (M) Moisture Content (Solid).	5
	3.2 ASTM D4464 (M) Particle Size Laser (Solid).	6
4	Particle Size.	8
5	Quality Control Sample Data.	12
	5.1 Sample Duplicate.	12
6	Glossary of Terms and Qualifiers.	13
7	Chain-of-Custody/Sample Receipt Form.	14

Work Order Narrative

Work Order: 15-10-1093Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 10/15/15. They were assigned to Work Order 15-10-1093.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of ≤ 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

Sample Summary

Client: ARCADIS U.S., Inc.	Work Order: 15-10-1093
10559 Citation Drive, Suite 100	Project Name: B0038001.0001.00016
Brighton, MI 48116-8382	PO Number:
	Date/Time Received: 10/15/15 10:00
	Number of Containers: 24

Attn: Sarah Greenfield

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
AUS-TS04	15-10-1093-1	10/13/15 09:00	4	Sediment
AUS-TS04	15-10-1093-2	10/13/15 09:00	2	Sea Water
AUS-TS03	15-10-1093-3	10/13/15 11:00	4	Sediment
AUS-TS03	15-10-1093-4	10/13/15 11:00	2	Sea Water
AUS-TS01	15-10-1093-5	10/13/15 13:00	4	Sediment
AUS-TS01	15-10-1093-6	10/13/15 13:00	2	Sea Water
AUS-TS02	15-10-1093-7	10/13/15 15:00	4	Sediment
AUS-TS02	15-10-1093-8	10/13/15 15:00	2	Sea Water

Analytical Report

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/15/15
Work Order: 15-10-1093
Preparation: N/A
Method: ASTM D-2216 (M)
Units: %

Project: B0038001.0001.00016

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04	15-10-1093-1-D	10/13/15 09:00	Sediment	N/A	10/19/15	10/20/15 12:00	F1020MOIB1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Moisture		61	0.10		1.00		
AUS-TS03	15-10-1093-3-D	10/13/15 11:00	Sediment	N/A	10/19/15	10/20/15 12:00	F1020MOIB1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Moisture		78	0.10		1.00		
AUS-TS01	15-10-1093-5-D	10/13/15 13:00	Sediment	N/A	10/19/15	10/20/15 12:00	F1020MOIB1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Moisture		56	0.10		1.00		
AUS-TS02	15-10-1093-7-D	10/13/15 15:00	Sediment	N/A	10/19/15	10/20/15 12:00	F1020MOIB1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Moisture		66	0.10		1.00		
Method Blank	099-05-014-5719	N/A	Solid	N/A	10/19/15	10/20/15 12:00	F1020MOIB1
<u>Parameter</u>		<u>Result</u>	<u>RL</u>		<u>DF</u>		<u>Qualifiers</u>
Moisture		ND	0.10		1.00		

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

ARCADIS U.S., Inc.
 10559 Citation Drive, Suite 100
 Brighton, MI 48116-8382

Date Received: 10/15/15
 Work Order: 15-10-1093
 Preparation: N/A
 Method: ASTM D4464 (M)
 Units: %

Project: B0038001.0001.00016

Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS04	15-10-1093-1-A	10/13/15 09:00	Sediment	LPSA 1	N/A	10/23/15 12:55	

<u>Parameter</u>	<u>Result</u>	<u>Qualifiers</u>
Clay (less than 0.00391mm)	1.87	
Silt (0.00391 to 0.0625mm)	45.19	
Total Silt and Clay (0 to 0.0625mm)	47.07	
Very Fine Sand (0.0625 to 0.125mm)	14.50	
Fine Sand (0.125 to 0.25mm)	9.47	
Medium Sand (0.25 to 0.5mm)	17.00	
Coarse Sand (0.5 to 1mm)	8.71	
Very Coarse Sand (1 to 2mm)	3.26	
Gravel (greater than 2mm)	ND	

AUS-TS03	15-10-1093-3-A	10/13/15 11:00	Sediment	LPSA 1	N/A	10/23/15 13:03	
-----------------	-----------------------	---------------------------	-----------------	---------------	------------	---------------------------	--

<u>Parameter</u>	<u>Result</u>	<u>Qualifiers</u>
Clay (less than 0.00391mm)	2.09	
Silt (0.00391 to 0.0625mm)	52.68	
Total Silt and Clay (0 to 0.0625mm)	54.78	
Very Fine Sand (0.0625 to 0.125mm)	22.79	
Fine Sand (0.125 to 0.25mm)	12.90	
Medium Sand (0.25 to 0.5mm)	6.62	
Coarse Sand (0.5 to 1mm)	2.92	
Very Coarse Sand (1 to 2mm)	ND	
Gravel (greater than 2mm)	ND	

AUS-TS01	15-10-1093-5-A	10/13/15 13:00	Sediment	LPSA 1	N/A	10/23/15 13:08	
-----------------	-----------------------	---------------------------	-----------------	---------------	------------	---------------------------	--

<u>Parameter</u>	<u>Result</u>	<u>Qualifiers</u>
Clay (less than 0.00391mm)	3.87	
Silt (0.00391 to 0.0625mm)	54.43	
Total Silt and Clay (0 to 0.0625mm)	58.30	
Very Fine Sand (0.0625 to 0.125mm)	19.61	
Fine Sand (0.125 to 0.25mm)	11.11	
Medium Sand (0.25 to 0.5mm)	10.91	
Coarse Sand (0.5 to 1mm)	0.080	
Very Coarse Sand (1 to 2mm)	ND	
Gravel (greater than 2mm)	ND	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Analytical Report

ARCADIS U.S., Inc.
 10559 Citation Drive, Suite 100
 Brighton, MI 48116-8382

Date Received: 10/15/15
 Work Order: 15-10-1093
 Preparation: N/A
 Method: ASTM D4464 (M)
 Units: %

Project: B0038001.0001.00016

Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
AUS-TS02	15-10-1093-7-A	10/13/15 15:00	Sediment	LPSA 1	N/A	10/23/15 13:16	

<u>Parameter</u>	<u>Result</u>	<u>Qualifiers</u>
Clay (less than 0.00391mm)	3.30	
Silt (0.00391 to 0.0625mm)	61.61	
Total Silt and Clay (0 to 0.0625mm)	64.91	
Very Fine Sand (0.0625 to 0.125mm)	18.70	
Fine Sand (0.125 to 0.25mm)	15.10	
Medium Sand (0.25 to 0.5mm)	1.28	
Coarse Sand (0.5 to 1mm)	ND	
Very Coarse Sand (1 to 2mm)	ND	
Gravel (greater than 2mm)	ND	



 Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

ARCADIS - Michigan

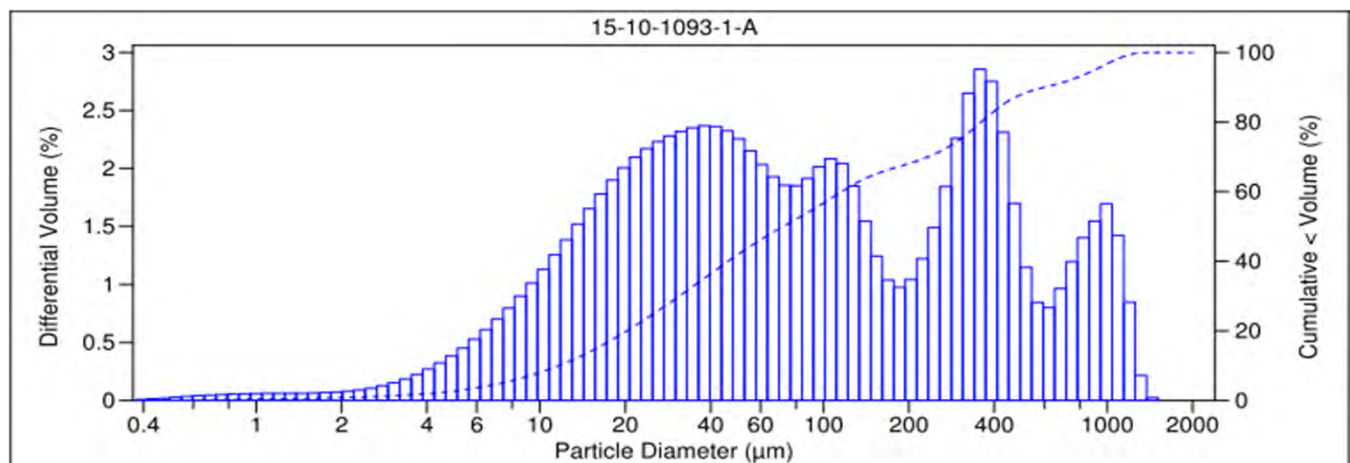
Date Sampled: 10/13/15
 Date Received: 10/15/15
 Work Order No: 15-10-1093
 Date Analyzed: 10/23/15
 Method: ASTM D4464M

Project: B0038001.0001.00016

Page 1 of 4

Sample ID	Depth ft	Description	Mean Grain Size mm
AUS-TS-04		Fine Sand	0.205

Particle Size Distribution, wt by percent								Total Silt & Clay
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	
0.00	3.26	8.71	17.00	9.47	14.50	45.19	1.87	47.07



V 3.0

PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

ARCADIS - Michigan

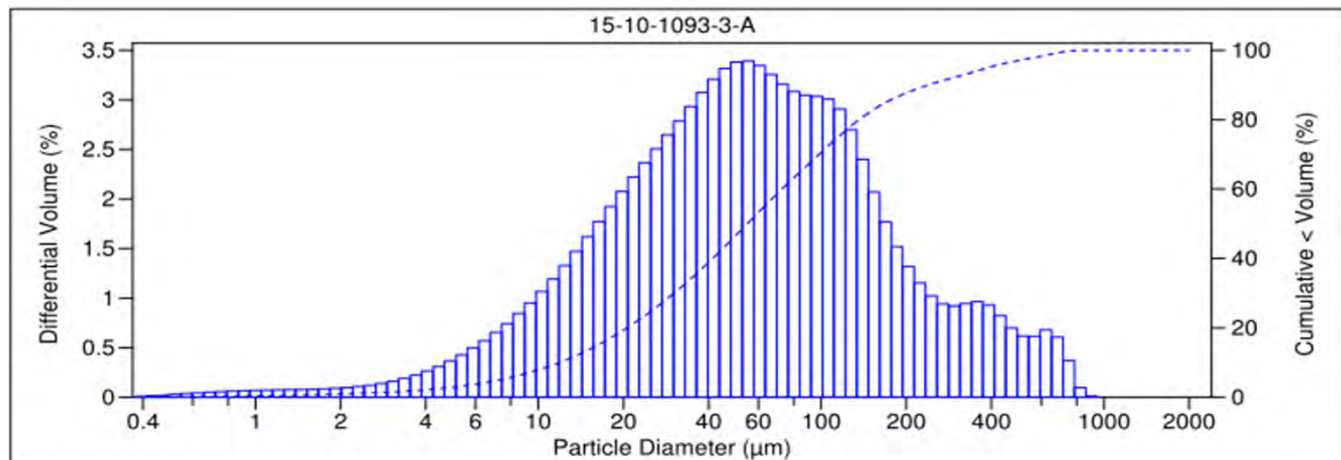
Date Sampled: 10/13/15
 Date Received: 10/15/15
 Work Order No: 15-10-1093
 Date Analyzed: 10/23/15
 Method: ASTM D4464M

Project: B0038001.0001.00016

Page 2 of 4

Sample ID	Depth ft	Description	Mean Grain Size mm
AUS-TS-03		Very Fine Sand	0.100

Particle Size Distribution, wt by percent								Total Silt & Clay
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	
0.00	0.00	2.92	6.62	12.90	22.79	52.68	2.09	54.78



V 3.0

PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

ARCADIS - Michigan

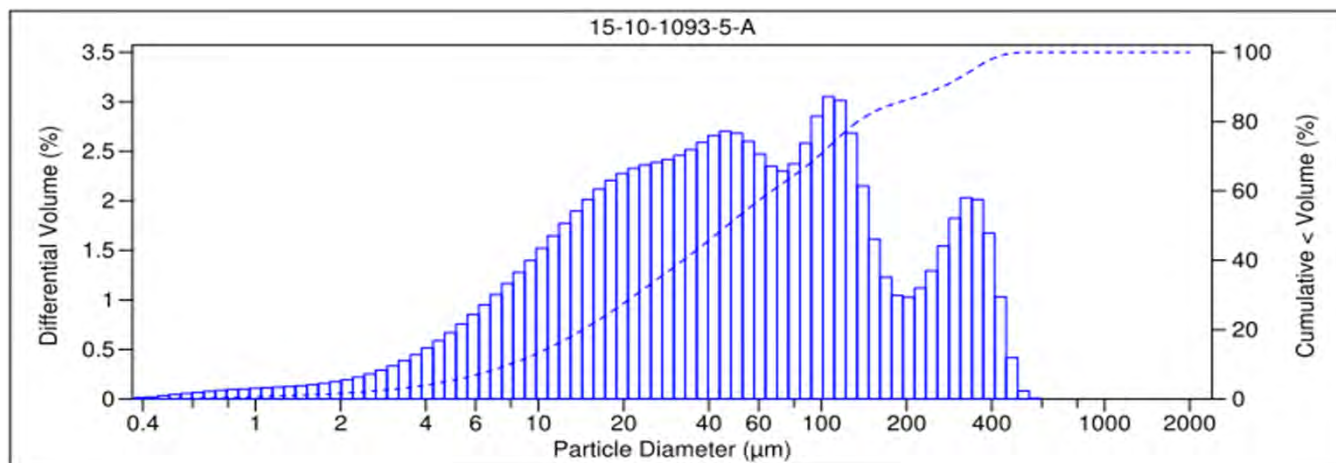
Date Sampled: 10/13/15
 Date Received: 10/15/15
 Work Order No: 15-10-1093
 Date Analyzed: 10/23/15
 Method: ASTM D4464M

Project: B0038001.0001.00016

Page 3 of 4

Sample ID	Depth ft	Description	Mean Grain Size mm
AUS-TS-01		Very Fine Sand	0.089

Particle Size Distribution, wt by percent								Total Silt & Clay
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	
0.00	0.00	0.08	10.91	11.11	19.61	54.43	3.87	58.30



V 3.0

PARTICLE SIZE SUMMARY

(ASTM D422 / D4464M)

ARCADIS - Michigan

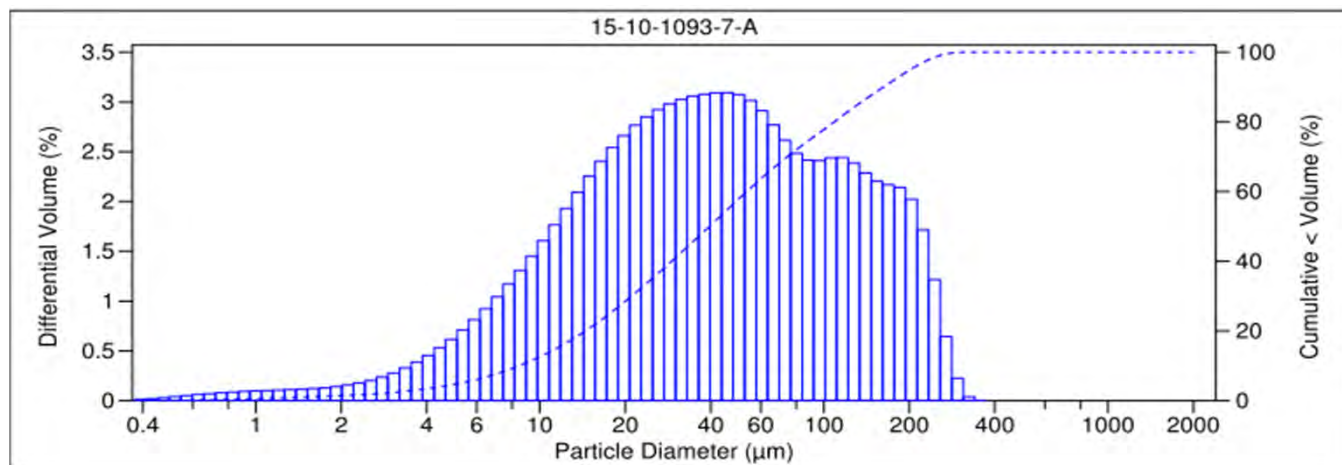
Date Sampled: 10/13/15
 Date Received: 10/15/15
 Work Order No: 15-10-1093
 Date Analyzed: 10/23/15
 Method: ASTM D4464M

Project: B0038001.0001.00016

Page 4 of 4

Sample ID	Depth ft	Description	Mean Grain Size mm
AUS-TS-02		Very Fine Sand	0.063

Particle Size Distribution, wt by percent								Total Silt & Clay
Total Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	
0.00	0.00	0.00	1.28	15.10	18.70	61.61	3.30	64.91



V 3.0



Calscience

Quality Control - Sample Duplicate

ARCADIS U.S., Inc.
10559 Citation Drive, Suite 100
Brighton, MI 48116-8382

Date Received: 10/15/15
Work Order: 15-10-1093
Preparation: N/A
Method: ASTM D-2216 (M)

Project: B0038001.0001.00016

Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
AUS-TS04	Sample	Sediment	N/A	10/19/15 00:00	10/20/15 12:00	F1020MOID1
AUS-TS04	Sample Duplicate	Sediment	N/A	10/19/15 00:00	10/20/15 12:00	F1020MOID1

<u>Parameter</u>	<u>Sample Conc.</u>	<u>DUP Conc.</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Moisture	61.30	64.30	5	0-10	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Glossary of Terms and Qualifiers

Work Order: 15-10-1093

Page 1 of 1

<u>Qualifiers</u>	<u>Definition</u>
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of ≤ 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.



Calscience

7440 Lincoln Way, Garden Grove, CA 92641-1427 • (714) 895-5494
For courier service / sample drop off information, contact us26_sales@eurofins.com or call us.

CHAIN-OF-CUSTODY RECORD

WFO NO. / LAB USE ONLY

15-10-1093

DATE: 10/13/15

PAGE: 1 OF 1

LABORATORY CLIENT:

ARCADIS ATTN- SARAH GREENFIELD

ADDRESS:

111 S.W. COLUMBIA ST. SUITE 670

CITY:

BETLAND

STATE:

OR

ZIP: 97201

TEL:

503-220-8201 Sarah.Greenfield@Arcadis.com

TURNAROUND TIME (Rush surcharges may apply to any TAT not "STANDARD"):

☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAYS ☒ STANDARD

EDD:

☐ COELT EDF ☐ OTHER

SPECIAL INSTRUCTIONS:

CLIENT PROJECT NAME / NO.:

PROJECT CONTACT:

GLOBAL ID:

LOG CODE:

SAMPLER(S): (PRINT)

P.O. NO.:

LAB CONTACT OR QUOTE NO.:

REQUESTED ANALYSES

Please check box or fill in blank as needed.

LAB USE ONLY	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.	Unpreserved	Preserved	Field Filtered	<input type="checkbox"/> TPH(g) <input type="checkbox"/> GRO	<input type="checkbox"/> TPH(d) <input type="checkbox"/> DRO	TPH <input type="checkbox"/> C6-C36 <input type="checkbox"/> C6-C44	TPH _____	BTEX / MTBE <input type="checkbox"/> 8260 <input type="checkbox"/> _____	VOCs (8260)	Oxygenates (8260)	Prep (5035) <input type="checkbox"/> En Core <input type="checkbox"/> Terra Core	SVOCs (8270)	Pesticides (8081)	PCBs (8082)	PAHs <input type="checkbox"/> 8270 <input type="checkbox"/> 8270 SIM	T22 Metals <input type="checkbox"/> 6010/747X <input type="checkbox"/> 6020/747X	Cr(VI) <input type="checkbox"/> 7196 <input type="checkbox"/> 7199 <input type="checkbox"/> 218.6	DEET / CGT (1602)	ORET (2.5g HOPE)	EET (1g HOPE)	
		DATE	TIME																							
1	AUS-TS04	10/13/15	0900	SED	4	<input checked="" type="checkbox"/>																				
2	AUS-TS04	10/13/15	0900	WATER	2	<input checked="" type="checkbox"/>																				
3	AUS-TS03	10/13/15	1100	SED	4	<input checked="" type="checkbox"/>																				
4	AUS-TS03	10/13/15	1100	WATER	2	<input checked="" type="checkbox"/>																				
5	AUS-TS01	10/13/15	1300	SED	4	<input checked="" type="checkbox"/>																				
6	AUS-TS01	10/13/15	1300	WATER	2	<input checked="" type="checkbox"/>																				
7	AUS-TS02	10/13/15	1500	SED	4	<input checked="" type="checkbox"/>																				
8	AUS-TS02	10/13/15	1500	WATER	2	<input checked="" type="checkbox"/>																				

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
		10/14/15	10:15
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
		10/15/15	1000

HABITAT PACK & SHIP
HABITAT FOR HUMANITY-HIAWATHALAND
401 DEER ST

MANISTIQUE, MI 49854
UNITED STATES US

ACTWGT: 66.0 LB
CAD: 809765/CAFE2807
DIMS: 24x14x13 IN

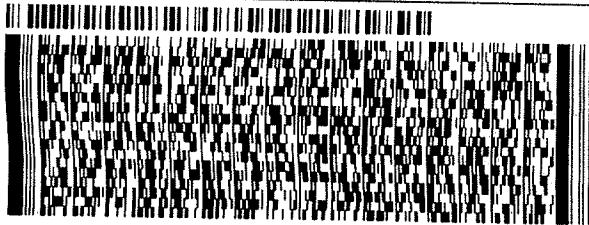
BILL THIRD PARTY

TO **CARLA LEE HOLLOWELL**
EUROFINS CALSCIENCE
7440 LINCOLN WAY

GARDEN GROVE CA 92841

(714) 895-5494
PO: 80038001.0001.00016

REF: 413-822-9631



FedEx
Express



521C3/401A/6F03
J1412140730011w

HABITAT PACK & SHIP
HABITAT FOR HUMANITY-HIAWATHALAND
401 DEER ST

MANISTIQUE, MI 49854
UNITED STATES US

ACTWGT: 59.2 LB
CAD: 809765/CAFE2807
DIMS: 24x14x13 IN

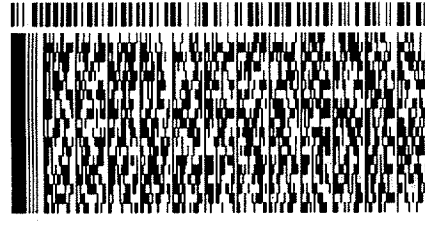
BILL THIRD PARTY

TO **CARLA LEE HOLLOWELL**
EUROFINS CALSCIENCE
7440 LINCOLN WAY

GARDEN GROVE CA 92841

(714) 895-5494
PO: 80038001.0001.00016

REF: 413-822-9631



FedEx
Express



521C3/401A/6F03
J1412140730011w

TRK# 6502 5175 1729
0201

THU - 15 OCT 10:30A
PRIORITY OVERNIGHT

NH APVA

92841
CA-US SNA

Part # 156148-434 RIT2 08/14



ORIGIN ID:MQTA (906) 341-7437
HABITAT PACK & SHIP
HABITAT FOR HUMANITY-HIAWATHALAND
401 DEER ST

MANISTIQUE, MI 49854
UNITED STATES US

SHIP DATE: 10:30
ACTWGT: 74
CAD: 809765
DIMS: 24x14x13 IN

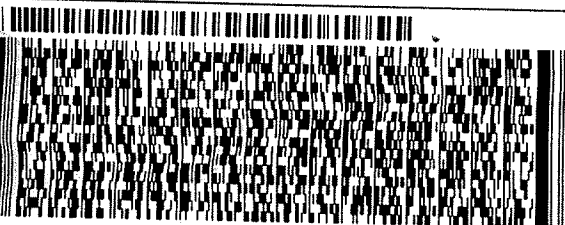
BILL THIRD PARTY

TO **CARLA LEE HOLLOWELL**
EUROFINS CALSCIENCE
7440 LINCOLN WAY

GARDEN GROVE CA 92841

(714) 895-5494
PO: 80038001.0001.00016

REF: 413-8229631



FedEx
Express



521C3/401A/6F03
J1412140730011w

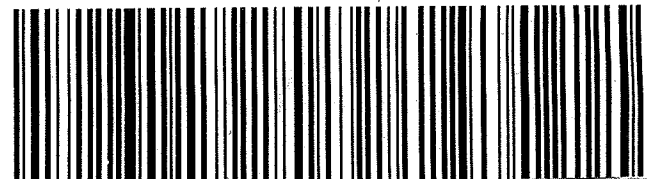
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THU - 15 OCT 10:30A
PRIORITY OVERNIGHT

NH APVA

92841
CA-US SNA

Part # 156148-434 RIT2 08/14



ORIGIN ID:MQTA (906) 341-7437
HABITAT PACK & SHIP
HABITAT FOR HUMANITY-HIAWATHALAND
401 DEER ST

MANISTIQUE, MI 49854
UNITED STATES US

SHIP DATE: 14OCT15
ACTWGT: 66.1 LB
CAD: 809765/CAFE2807
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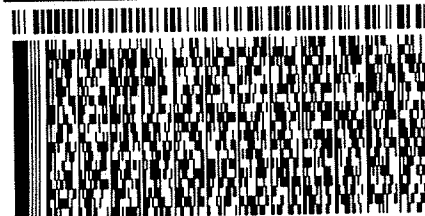
BILL THIRD PARTY

TO **CARLA LEE HOLLOWELL**
EUROFINS CALSCIENCE
7440 LINCOLN WAY

GARDEN GROVE CA 92841

(714) 895-5494
PO: 80038001.0001.00016

REF: 413-822-9631



FedEx
Express



521C3/401A/6F03
J1412140730011w

TRK# 6502 5175 1718
0201

THU - 15 OCT 10:30A
PRIORITY OVERNIGHT

NH APVA

92841
CA-US SNA

TRK# 6502 5175 1740
0201

THU - 15 OCT 10:30A
PRIORITY OVERNIGHT

NH APVA

92841
CA-US SNA

Part # 156148-434 RIT2 08/14



Return to Contents

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 4

CLIENT: ARCADIS

DATE: 10/15/2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF:-0.4°C); Temperature (w/o CF): 3.6 °C (w/ CF): 3.2 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: IS

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: IS

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☒ Not Present ☐ N/A

Checked by: qbs

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers			
<input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna₂ ☐ 100PJ ☐ 100PJna₂ ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB

☐ 125PBz₂na ☐ 250AGB ☐ 250CGB ☐ 250CGBs ☐ 250PB ☐ 250PBn ☐ 500AGB ☐ 500AGJ ☐ 500AGJs

☐ 500PB ☐ 1AGB ☐ 1AGBna₂ ☐ 1AGBs ☐ 1PB ☐ 1PBna ☒ 16oz cube ☒ 2-5gal ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (____) ☐ EnCores® (____) ☐ TerraCores® (____)

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ Other Matrix (Sediment): ☒ 16oz bag ☐ _____

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: qbs

s = H₂SO₄, u = ultra-pure, z₂na = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: _____

SAMPLE RECEIPT CHECKLIST

COOLER 2 OF 4

CLIENT: ARCADIS

DATE: 10 / 15 / 2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF:-0.4°C); Temperature (w/o CF): 2.9 °C (w/ CF): 2.5 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: IS

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: IS

Sample(s) ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: qbs

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers			
<input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOA_h ☐ VOA_{na2} ☐ 100PJ ☐ 100PJ_{na2} ☐ 125AGB ☐ 125AGB_h ☐ 125AGB_p ☐ 125PB

☐ 125PB_z ☐ 250AGB ☐ 250CGB ☐ 250CGB_s ☐ 250PB ☐ 250PB_n ☐ 500AGB ☐ 500AGJ ☐ 500AGJ_s

☐ 500PB ☐ 1AGB ☐ 1AGB_{na2} ☐ 1AGB_s ☐ 1PB ☐ 1PB_{na} ☒ 16oz CGJ ☒ 12.5g soil core ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ Other Matrix (sediment): ☒ 16oz CGJ ☐ _____

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: qbs

s = H₂SO₄, u = ultra-pure, z_{na} = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: _____

SAMPLE RECEIPT CHECKLIST

COOLER 3 OF 4

CLIENT: ARCADIS

DATE: 10/15/2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF:-0.4°C); Temperature (w/o CF): 2.7 °C (w/ CF): 2.3 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: 15

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: 15

Sample(s) ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: 965

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers <input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna₂ ☐ 100PJ ☐ 100PJna₂ ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB

☐ 125PBznn ☐ 250AGB ☐ 250CGB ☐ 250CGBs ☐ 250PB ☐ 250PBn ☐ 500AGB ☐ 500AGJ ☐ 500AGJs

☐ 500PB ☐ 1AGB ☐ 1AGBna₂ ☐ 1AGBs ☐ 1PB ☐ 1PBna ☒ 1qt cube ☒ 2.5gal cube ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ Other Matrix (sediment): ☒ 16oz cat ☐ _____

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: 965

s = H₂SO₄, u = ultra-pure, znn = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: 300

SAMPLE RECEIPT CHECKLIST

COOLER 4 OF 4

CLIENT: ARCADIS

DATE: 10 / 15 / 2015

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2 (CF:-0.4°C); Temperature (w/o CF): 2.5 °C (w/ CF): 2.2 °C; ☒ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: 15

CUSTODY SEAL:

Cooler ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: 15

Sample(s) ☐ Present and Intact ☐ Present but Not Intact

☒ Not Present

☐ N/A

Checked by: 965

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC document(s) received complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sampling date <input type="checkbox"/> Sampling time <input type="checkbox"/> Matrix <input type="checkbox"/> Number of containers			
<input type="checkbox"/> No analysis requested <input type="checkbox"/> Not relinquished <input type="checkbox"/> No relinquished date <input type="checkbox"/> No relinquished time			
Sampler's name indicated on COC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with COC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and in good condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper containers for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume/mass for analyses requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samples received within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aqueous samples for certain analyses received within 15-minute holding time			
<input type="checkbox"/> pH <input type="checkbox"/> Residual Chlorine <input type="checkbox"/> Dissolved Sulfide <input type="checkbox"/> Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Proper preservation chemical(s) noted on COC and/or sample container	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unpreserved aqueous sample(s) received for certain analyses			
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Total Metals <input type="checkbox"/> Dissolved Metals			
Container(s) for certain analysis free of headspace	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Volatile Organics <input type="checkbox"/> Dissolved Gases (RSK-175) <input type="checkbox"/> Dissolved Oxygen (SM 4500)			
<input type="checkbox"/> Carbon Dioxide (SM 4500) <input type="checkbox"/> Ferrous Iron (SM 3500) <input type="checkbox"/> Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CONTAINER TYPE:

(Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOA_h ☐ VOA_{na2} ☐ 100PJ ☐ 100PJ_{na2} ☐ 125AGB ☐ 125AGB_h ☐ 125AGB_p ☐ 125PB

☐ 125PB_{znna} ☐ 250AGB ☐ 250CGB ☐ 250CGB_s ☐ 250PB ☐ 250PB_h ☐ 500AGB ☐ 500AGJ ☐ 500AGJ_s

☐ 500PB ☐ 1AGB ☐ 1AGB_{na2} ☐ 1AGB_s ☐ 1PB ☐ 1PB_{na} ☒ 1 gal cube ☒ 2.5 gal cube ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ Other Matrix (Sediment): ☒ 16oz cgt ☐ _____

Container: A = Amber, B = Bottle, C = Clear, E = Envelope, G = Glass, J = Jar, P = Plastic, and Z = Ziploc/Resealable Bag

Preservative: b = buffered, f = filtered, h = HCl, n = HNO₃, na = NaOH, na₂ = Na₂S₂O₃, p = H₃PO₄, Labeled/Checked by: 965

s = H₂SO₄, u = ultra-pure, znna = Zn(CH₃CO₂)₂ + NaOH

Reviewed by: 300

APPENDIX B

Technical Specifications



SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. This Section includes the following Articles:

<u>Article</u>	<u>Title</u>
1.1	Section Includes
1.2	Location and Description of Work
1.3	Work by Others
1.4	Work by OWNER
1.5	Sequence and Progress of Work
1.6	CONTRACTOR's Use of Site
1.7	Easements and Rights-of-Way
1.8	Existing Structures and Underground Facilities
1.9	Notices to Owners and Authorities of Properties Adjacent to the Work
1.10	Submittals

1.2. LOCATION AND DESCRIPTION OF WORK

- A. The Work is located in the City of Manistique, Schoolcraft County, Michigan. The Manistique River Area of Concern includes an approximately 1.7 mile stretch of the Manistique River that extends from the dam in the City of Manistique to the mouth of the Harbor at Lake Michigan and is divided into seven zones numbered Zone 1 through Zone 7. The Work includes remedial activities in Zones 3 and 4.
1. Zone 3 consists of a pair of bays, referred to as North Bay and West Bay. North Bay ranges from 100 to 200 ft wide and is approximately 500 ft long. Water depths range from shallow at the northern border of the bay to 9-10 ft in its center channel. West Bay is approximately 75 ft wide and 500 ft long, including the bend. Both bays abut the industrial areas to the north. West Bay abuts a small forested area, and Route 2 crosses over the mouth of North Bay.
 2. Zone 4 consists of a 150-ft-wide, 500-ft-long bay that is currently used as a private marina. The marina is shallow, with typical water depths of 4-5 ft. Zone 4 is connected to Zone 3 through a culvert under Route 2 just south of the bend in West Bay. Zone 4 is bordered by Route 2 to the north and by forested or open ground associated commercial properties to the west and east.
- B. The Work to be performed under this Contract includes, but is not limited to, constructing the Work described below and all related appurtenances. The Work includes, but is not limited to, the following:
1. Mobilization.
 2. Installation and maintenance of temporary controls.
 3. Installation and maintenance of support facilities.
 4. Debris removal.
 5. Dredging of PCB impacted sediments.
 6. Sediment dewatering and solidification.
 7. Handling and disposal of TSCA and non-TSCA materials.
 8. Water handling and disposal.
 9. Placement of a residuals cover layer, where needed.

10. Survey.
11. Site restoration.
12. Demobilization.

C. Contracting Method: The Project shall be constructed under one prime Contract.

D. Hazardous Environmental Conditions:

1. Hazardous Environmental Conditions, described in the following reports referenced, will affect the Work:
 - a. Arcadis. 2016. Operable Unit 1: Final Design Report. Manistique River Area of Concern, Schoolcraft County, Michigan. April.
 - b. CH2M HILL. 2012. Historical Document Review and Information Summary, Manistique River Area of Concern, Manistique, Michigan. Draft. U.S. Environmental Protection Agency Contract No. EP-S5-06-01.
 - c. EA Engineering, Science, and Technology, Inc. (EA) and Foth Infrastructure and Environment, LLC (Foth). 2013a. Part One Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. June.
 - d. EA and Foth. 2013b. Part Two Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. September.
 - e. EA and Foth. 2013c. Final Conceptual Site Model for the Manistique River Area of Concern, Schoolcraft County, Michigan. Revision 01. April.
 - f. EA. 2013. Field Sampling and Analysis Report for the Part Two Feasibility Study for Operable Unit 1: Zones 2, 3, and 4 Manistique Area of Concern, Schoolcraft County Michigan. Revision 02. December.

1.3. WORK BY OTHERS

- A. Dock removal in Zone 4 will be performed by the property owner. CONTRACTOR shall notify PROFESSIONAL at least 7 business days prior to start of work in Zone 4. Professional will notify property owner of work and request dock removal.

1.4. WORK BY OWNER

- A. OWNER, or their designated representative (e.g., PROFESSIONAL, Resident Project Representative), will perform the following in connection with the Work:
 1. Sediment Confirmation Sampling.
 2. Water Column Monitoring.
 3. Community Air Monitoring.
- B. CONTRACTOR shall provide OWNER, PROFESSIONAL, and designated stakeholders with safe and reasonable access to inspect and observe the Work, including working/office space.
- C. OWNER, or PROFESSIONAL, will perform on-site observation of work progress and quality of executed work to determine, in general, if the Work is proceeding in accordance with the Contract Schedule and Contract Documents. Whenever OWNER considers it necessary or advisable to ensure the proper carrying out of the intent of the Contract Documents, OWNER shall have authority to require CONTRACTOR to make special examination or testing of the Work (whether or not fabricated, installed or completed).
- D. No matter how extensive or intensive OWNER or PROFESSIONAL inspections, the OWNER and PROFESSIONAL will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and will not be responsible for CONTRACTOR's failure to carry out the Work in accordance with the Contract Documents. OWNER's and PROFESSIONAL's duties, services,

and work shall in no way supersede or dilute CONTRACTOR's obligation to perform the Work in conformance with all Contract requirements.

1.5. SEQUENCE AND PROGRESS OF WORK

A. Sequencing:

1. Incorporate sequencing of the Work into the Progress Schedule in accordance with Section 01 32 16, Progress Schedule.
2. Sequencing Requirements. CONTRACTOR shall perform the Work in the sequence below (items d through j may be performed concurrently):
 - a. Pre-mobilization.
 - b. Pre-construction survey.
 - c. Mobilization.
 - d. Debris removal.
 - e. Targeted sediment removal.
 - f. Confirmation sediment sampling (performed after each dredging pass).
 - g. Dredge cleanup pass(es) (up to two additional where required).
 - h. Post-removal survey.
 - i. Installation of sand cover (where required).
 - j. Excavated material handling, transporting, and off-site processing and disposal.
 - k. Restoration.
 - l. Post-construction survey.
 - m. Decontamination/demobilization.
 - n. Preparation and submittal of project/contract close out documents.
3. Sediment removal in Zone 3 shall be performed prior to sediment removal in Zone 4.

1.6. CONTRACTOR'S USE OF SITE

- A. CONTRACTOR's use of the Site shall be confined to the areas shown on the Drawings.
- B. CONTRACTOR shall obtain approval of material and equipment staging and laydown areas from OWNER and PROFESSIONAL. CONTRACTOR shall move stored materials and equipment that interfere with the OWNER's operations, other contractors, and others performing work for the OWNER.
- C. Limits on CONTRACTOR's use of the Site are:
 1. Work shall only be performed during the hours defined in the General Conditions, Article 8.3.
 2. Do not use the Site for operations other than those required for the Project.
 3. Dredging in Zone 4 is prohibited before August 1, 2016.

1.7. EASEMENTS AND RIGHTS-OF-WAY

A. General:

1. Easements and rights-of-way required for the permanent improvements included in the Work will be provided by OWNER.
2. Confine construction operations within public rights-of-way, easements obtained by OWNER, and limits shown, and property for which CONTRACTOR has made arrangements directly with property owner(s).
3. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic.
4. Do not enter private property outside the construction limits without permission from the owner of the property.

- B. On Private Property:
 - 1. General limits of OWNER-furnished easements are shown on the Drawings.
- C. Within Highway and Railroad Rights-of-Way:
 - 1. Permits required for the permanent facilities will be obtained by OWNER. CONTRACTOR shall obtain and pay for work permits and fees for safety and inspection forces to be furnished by the right-of-way owner.
 - 2. Work performed and CONTRACTOR's operations within limits of railroad and highway rights-of-way shall comply with requirements of railroad or highway owner and applicable work permits, or authority having jurisdiction over right-of-way.

1.8. EXISTING STRUCTURES AND UNDERGROUND FACILITIES

- A. Verification of Conditions
 - 1. Before performing site Work, all Underground Utilities, lines and cables (public and private) must be located and marked in accordance with the Contract Documents. Underwater utilities shall be considered "Underground Utilities" for the purpose of the Contract Documents. CONTRACTOR shall contact and coordinate with MISS DIG to locate and mark utilities located near or within Work areas. In addition, the CONTRACTOR must be responsible for immediately notifying the OWNER of any contact with or damage to Underground Utilities, and for the safety, protection of and repairing any damage done to any Work, surface and subsurface facilities.
 - 2. In certain instances, it may be beneficial to assess the potential presence of existing subsurface structures in advance of the specific work activities that may encounter such structures (e.g., test excavation to confirm the locations of utilities, foundations, or other subsurface structures). Such activities shall be performed in a safe manner, using appropriate means and methods, and with proper dust and odor/vapor control measures, and consistent with all applicable provisions of the Contract Documents. CONTRACTOR shall immediately backfill any such exploratory excavations, unless otherwise directed by the OWNER/PROFESSIONAL.
- B. Protection
 - 1. Unless specified for removal, CONTRACTOR shall protect from damage any and all pavements, sidewalks, curbs, signs, fencing, buildings, drainage features, culverts, utility poles, guy wires, piezometers, and other property in and around the limits of Work. If damaged during the Work, or temporarily removed to facilitate the Work, such items shall be replaced and restored to their original condition at the CONTRACTOR's expense and to the satisfaction of the OWNER.
 - 2. Contact and coordinate with appropriate utility owners to field-verify the status (active or inactive) of Underground Utilities, and for the temporary bracing, deactivation, removal, relocation, and/or replacement of any Underground Utilities, utility poles, or guy wires that are located near or within Work areas, or that may be affected by the Work.
 - 3. Unless specified for removal, CONTRACTOR shall sustain in their places and protect from direct or indirect injury all existing structures and Underground Utilities located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility. Before proceeding with the Work of sustaining and supporting such structure or facility, the CONTRACTOR shall satisfy the OWNER and PROFESSIONAL that methods and procedures to be used have been approved by the party owning the same.
 - 4. CONTRACTOR shall bear all risks attending the presence or proximity of all structures and Underground Facilities within or adjacent to limits of the Work, in accordance with the Contract Documents. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury caused by its Work to existing structures and facilities that are not otherwise specified for removal. CONTRACTOR shall repair immediately and completely

damage caused by its Work, to the satisfaction of the owner of the damaged structure or facility.

5. If damage occurs to any portion of an existing structure or Underground Facility, or to the material surrounding or supporting the same, CONTACTOR shall immediately notify the OWNER, PROFESSIONAL, and owner of the damaged structure or facility and completely repair any damage caused by its Work to the satisfaction of the owner of the damaged structure or facility.
 - a. Collect, containerize, characterize, and appropriately dispose of any materials released from the damaged structure or facility.
 - b. Provide provisions for alternate or temporary service until repairs are completed.
 - c. Provide assistance to the utility owner during repairs unless authorized by the utility owner to undertake such repairs directly.

1.9. NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

- A. Notify OWNER and PROFESSIONAL when performance of the Work may affect owners of adjacent property and utilities. OWNER or PROFESSIONAL will notify owners of adjacent property and utility owners when prosecution of the Work may affect their property, facilities, or use of property.
- B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable OWNER to notify affected person and for affected persons to provide for their needs.

1.10. SUBMITTALS

- A. Operations Plan: CONTRACTOR shall prepare an Operations Plan that presents the CONTRACTOR's detailed approach for implementing the required work activities. The Operations Plan shall include, at a minimum, the following sections or reference the appropriate separate submittals:
 1. General:
 - a. The tasks and objectives of the Site operations and the logistics and resources required to achieve those tasks and objectives.
 - b. The anticipated activities as well as CONTRACTOR's normal operating procedures.
 - c. The personnel and equipment requirements for implementing the Operations Plan.
 2. Support Area Layout and Construction, in accordance with Section 01 55 13, Access Roads and Support Areas.
 3. Temporary Control Plans, in accordance with Section 01 57 00, Temporary Controls and including:
 - a. Turbidity and Sheen Control Plan.
 - b. Odor, Dust, and Vapor Control Plan.
 - c. Noise Control Plan.
 - d. Pollution Control Plan.
 - e. Traffic Control Plan.
 4. Surveying Plan, in accordance with Section 01 71 23, Field Engineering.
 5. Material Handling and Disposal Plan, in accordance with Section 02 61 10, Handling and Disposal of Impacted Material.
 6. Transportation and Handling Plan:
 - a. Procedures that will be used to ensure safe waste handling during the excavating, handling, temporary staging, and storage, loading, and transporting activities.
 - b. Twenty-four hour telephone contact information in the event of an accident during waste transportation activities.
 7. Wastewater Treatment Work Plan, in accordance with Section 02 73 00, Wastewater Handling and Disposal.

8. Wastewater Treatment Operations Training Plan, in accordance with Section 02 73 00, Wastewater Handling and Disposal.
 9. Soil Erosion and Sedimentation Control Implementation Plan, in accordance with Section 31 25 00, Soil Erosion and Sedimentation Control (shall be included as appendix to Operations Plan or provided as a standalone document).
 10. Dredging and Cover Work Plan, in accordance with Section 35 20 23, Dredging and Cover.
- B. Health and Safety Plan: CONTRACTOR shall prepare and submit a site-specific Health and Safety Plan in accordance with Section 01 35 29, CONTRACTOR's Health and Safety Plan, that addresses known Hazardous Environmental Conditions identified in this Section.
- C. Contingency Plan: CONTRACTOR's Contingency Plan shall detail the following procedures for emergency preparedness and contingencies (at a minimum):
1. Onsite pre-treatment system contingency measures.
 2. Spill prevention and spill response.
 3. Emergency access/egress.
 4. Emergency evacuation of personnel from the work site, including water rescue.
 5. Methods to contain gasoline/diesel fuel or hydraulic oil spills.
 6. Listing of all contact personnel and emergency phone numbers.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.1. SCOPE

- A. Scope:
 - 1. This Section includes administrative and procedural requirements governing the following types of allowances:
 - a. Cash allowances.
 - b. Provisionary allowances.
- B. Authorization of Allowances:
 - 1. Work that will be paid under an allowance will be authorized in OWNER's written instruction to CONTRACTOR using the form included with this Section or other written allowance authorization issued by OWNER.
 - 2. Do not perform Work under an allowance without written authorization of OWNER.

1.2. CASH ALLOWANCES:

- A. Bidders must include in their Base Proposal Sum a cash allowance in the amount as specified on the Bid Schedule. The base bid shall include bonds and insurance on the value of the allowance.
- B. Monies in the allowance will be used only if directed in writing by the Project Director and PROFESSIONAL.
- C. Payments under a Cash Allowance must be on actual cost and exclude cost for supervision, handling, unloading, storage, installation, testing, fee, premiums for bond and insurance, etc.
- D. Unused allowances will be deducted from the contract amount through contract change order.

1.3. PROVISIONARY ALLOWANCE

- A. Bidders must include in their Base Proposal Sum a provisionary allowance in the amount as specified on the Bid Schedule. The base bid shall include bonds and insurance on the value of the allowance.
- B. Provisionary Allowances are stipulated amounts available as reserve for sole use by OWNER to cover unanticipated costs.
- C. Monies will be used in the contingency allowance only if directed in writing by the Project Director and PROFESSIONAL.
- D. Payments under a Provisionary Allowance will include not only the purchase/furnished cost of the materials and equipment involved, but also all related labor costs, subcontract costs, construction equipment costs, general conditions costs and Fee, provided they are calculated in accordance with the requirements of the Contract Documents.
- E. Unused allowances will be deducted from the contract amount through contract change order.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. ATTACHMENTS

- A. The documents listed below, and attached following this Section's "End of Section" designation, are part of this Specification Section.
 - 1. Allowance Authorization Form (one page).

END OF SECTION

ALLOWANCE AUTHORIZATION

Project: Manistique River Area of Concern: OU1 (Zones 3 and 4)
Dredging Project
To: _____
Re: _____

Authorization Number:
From: _____
Date: _____
File No.: 761/14004.SAR
Contract For: _____

You are authorized to perform the following item(s) of Work and to adjust the Contract allowance amount accordingly:

1. *[Allowance Title] / [Title of Change]:*

THIS IS NOT A CHANGE ORDER AND DOES NOT INCREASE OR DECREASE THE CONTRACT PRICE

Original Allowance	\$	_____
Allowance Expenditures prior to this Authorization.....	\$	_____
Allowance Balance prior to this Authorization.....	\$	_____
Allowance will be decreased by this Authorization.....	\$	_____
New Allowance Balance.....	\$	_____

RECOMMENDED BY

Professional

By _____ Date _____
CONTRACTOR ACCEPTANCE

Contractor

By _____ Date _____

OWNER APPROVAL

Owner

By _____ Date _____

☐ Attachments

Copies: ☐ Owner ☐ Contractor ☐ Consultants ☐ _____ ☐ _____ ☐ File

SECTION 01 22 10

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. Items listed starting in Article 1.4 of this Section refer to and are the same pay items listed in the Bid Form and constitute all pay items for completing the Work.
 - 2. No direct or separate payment will be made for providing miscellaneous, temporary, or accessory works, services, CONTRACTOR's or PROFESSIONAL's field offices, layout surveys, Project signs, sanitary requirements, testing, safety provisions and safety devices, approval of submittals and record drawings, water supplies, power and fuel, maintenance of traffic, removal of waste, security, coordination with OWNER's operations, information technology (including hardware, software, and services) required during construction, commissioning where specified, bonds, insurance, or other requirements of the General Conditions, Supplementary Conditions, General Requirements, and other requirements of the Contract Documents.
 - 3. Compensation for all services, items, materials, and equipment shall be included in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract.
- B. Each lump sum and unit price, as bid, shall include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

1.2. SCHEDULE OF VALUES

- A. Before the construction start date, CONTRACTOR must submit a Schedule of Values to the PROFESSIONAL for review and approval, of the various tasks that must be performed to complete all the Work in accordance with Article 12.1 of the General Conditions. The schedule must show each task and the corresponding value of the task quantified in terms of labor, equipment, or materials, and shall include separate monies allocated for General Condition items and Project close-out. The aggregate total value for all tasks must be equal to the total Contract sum.

1.3. ESTIMATE OF QUANTITIES

- A. Estimated quantities for unit price pay items, as listed in the Bid Schedule, are approximate only and are included solely for the purpose of comparison of Bids. Neither OWNER nor PROFESSIONAL expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required will correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity, as OWNER may deem necessary.

1.4. MEASUREMENT AND PAYMENT ITEMS

- A. Item 1 – Submittals, Preconstruction Conference, and General Requirements:
 - 1. Description: Item 1 includes coordination of Work as specified, preparation of all submittals, CONTRACTOR's attendance at a preconstruction conference, performance of all tasks described in Section 01 31 19 Project Meetings, all permitting not referenced in other bid items, project management, temporary facilities, general condition

- requirements, and premiums for the required Bonds and for insurance obtained by the CONTRACTOR to comply with the requirements of the Contract Documents.
2. Measurement and Payment: Measurement shall be based on completion of submittals, preconstruction conference attendance, completing progress meetings, and project administration to the satisfaction of the PROFESSIONAL, demonstration of required Bonds and insurance, and completion of permit applications and receipt of permits. Lump sum payment for Item 1 will be full compensation for all labor, equipment, materials, and incidentals necessary for performing the submittals, preconstruction conference activities, and project general requirements, but not specifically included in other pay items.
- B. Item 2 – Mobilization:
1. Description: Item 2 includes mobilization of CONTRACTOR's equipment, tools, incidentals, and temporary facilities specified and required to complete the Work. Mobilization pay item shall conform to Instruction to Bidders (Section 00100), Article 16.
 2. Measurement and Payment: Measurement shall be based on completion of the CONTRACTOR's mobilization to the site. Lump sum payment for Item 2 will be full compensation for all labor, equipment, materials, and incidentals necessary for mobilizing the CONTRACTOR's equipment, tools, incidentals, and temporary facilities specified and required to complete the Work.
- C. Item 3 – Site Preparation:
1. Description: Item 3 includes preparation of the Site, including but not limited to:
 - a. Utilities clearance for areas affected by the work in accordance with Section 01 11 00.
 - b. Clearing and grubbing areas impacted by construction activities, as necessary to perform the Work and in accordance with Section 31 10 00.
 - c. Construct and maintain access roads and support areas in accordance with Section 01 55 13.
 - d. Perform pre-construction and post-construction soil sampling as required by Section 01 55 13.
 2. Measurement and Payment: Measurement shall be based on completion of Site preparation and maintenance activities. Lump sum payment for Item 3 will be full compensation for all labor, equipment, materials, and incidentals necessary for performing this item of the Work, but not specifically included in other pay items.
- D. Item 4 – SESC Implementation Plan, Installation, Maintenance, and Removal of Temporary SESC Measures:
1. Description: Item 4 includes CONTRACTOR's development and submission of SESC Implementation Plans and SESC Permit Application; installation, maintenance and removal of temporary soil erosion and sedimentation controls required for completion of the Work that are not specifically included in other pay items.
 2. Measurement and Payment: Measurement shall be based on completion and submission of the SESC Implementation Plan and SESC Permit Application, and the receipt of permits and authorizations. The installation, maintenance, and removal of all temporary SESC measures required under the permit and as necessary to complete the Work. Lump sum payment for Item 4 will be full compensation for all labor, equipment, materials, and incidentals necessary for performing this item of the Work, but not specifically included in other pay items.
- E. Item 5 – Temporary Dust and Odor Controls:
1. Description: Item 5 includes installation, maintenance, and removal of temporary dust and odor controls required for completion of the Work, including temporary dust and odor controls required in Section 01 57 00.
 2. Measurement and Payment: Measurement shall be based on completion of dust and odor control to the satisfaction of the PROFESSIONAL and OWNER. Lump sum payment

for Item 5 will be full compensation for all labor, equipment, materials, and incidentals necessary for performing temporary dust and odor controls.

F. Item 6 – Temporary Sheen and Resuspension Controls:

1. Description: Item 6 includes mobilization, installation, maintained, decontamination (as appropriate), demobilization, and disposal (as appropriate) of the temporary sheen and resuspension controls specified in Section 01 57 00. Item 6 also includes providing all of CONTRACTOR's personnel, materials, equipment, and supplies necessary for utilizing the temporary sheen and resuspension controls for the dredging to the specified depths.
2. Measurement and Payment: Measurement shall be based on completion of temporary sheen and resuspension controls to the satisfaction of the PROFESSIONAL and OWNER. Lump sum payment for Item 6 will be full compensation for all labor, equipment, materials, and incidentals necessary for performing temporary sheen and resuspension controls.

G. Item 7 – Debris Removal:

1. Description: Item 7 includes providing all labor, equipment, materials, expenses, and transport necessary to remove, manage, and size debris for disposal as necessary to accomplish the Work.
2. Measurement and Payment: Measurement shall be based on completion of debris removal to complete dredging activities. Lump sum payment for Item 7 will be full compensation for all labor, equipment, materials, and incidentals necessary for removing and managing debris to complete dredging work.

H. Item 8 – Survey:

1. Description: Item 8 includes all labor, equipment, materials, supplies, and incidentals required to perform all survey-related activities, including topographic and bathymetric surveys, to document the Work completed. Survey activities shall be completed in accordance with Section 01 71 23.
2. Measurement and Payment: Measurement shall be based on acceptance of the specified survey-related documentation submitted by the CONTRACTOR to the PROFESSIONAL. Lump sum payment for Item 8 will be full compensation for all survey-related activities.

I. Item 9 – Installation of Permanent SESC Control Measures and Site Restoration:

1. Description: Item 9 includes labor, equipment, materials, supplies, and transport activities required to restore support areas, and furnish and install the materials required to complete surface restoration in accordance with the plans and specifications. This pay item includes placement and spreading of the imported top soil, and irrigation of the seeding as necessary to establish vegetative growth as specified. This pay item also includes all required material testing and certifications, and all other associated work and expenses incidental thereto, for which payment is not provided under other items.
2. Measurement and Payment: Measurement shall be based on the completed installation of the SESC measures, completion of site restoration activities, and establishment of the vegetative growth as specified. Lump sum payment for Item 9 will be full compensation for this pay item.

J. Item 10 – Water Treatment: On-Site Pre-Treatment:

1. Description: Item 10 includes collection and pre-treatment of construction water as required to complete the Work in accordance with the plans and specifications. Construction water includes liquids from scows, sumps, staging areas, precipitation events and other sources or as directed by the OWNER. Item 10 includes costs to install and maintain the onsite pre-treatment system and all associated equipment to pre-treat construction water in accordance with Section 02 73 00. Item 10 also includes costs to decontaminate onsite pre-treatment system components at the completion of work and the required waste characterization, manifesting, and disposal of the initial volume of media from the treatment system.

2. Measurement and Payment: Measurement shall be based on completion of water pre-treatment to meet the requirements of the Discharge Permit. Lump sum payment will be full compensation for all labor, equipment, materials, and incidentals necessary for performing this task.
- K. Item 11 – Water Treatment: Discharge Monitoring, Maintenance, and Sampling:
1. Description: Item 11 includes all labor, equipment, supplies, and laboratory costs for operating, monitoring, and sampling of the onsite pre-treatment system discharge in accordance with Section 02 73 00 and the Discharge Permit.
 2. Measurement and Payment: Measurement shall be based on the PROFESSIONAL's review of the specified monitoring and sampling reports submitted by the CONTRACTOR. Payment shall be based on the unit price per week of sampling as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for operating, monitoring, and maintenance of the onsite pre-treatment system discharge.
- L. Item 12 – Water Treatment: Discharge to POTW:
1. Description: Item 12 includes reimbursement of direct costs for transportation and discharge of pre-treated water from the onsite pre-treatment system to an offsite, licensed publically owned treatment works (POTW) in accordance with Section 02 73 00.
 2. Measurement and Payment: Measurement shall be based on per 1,000 gallons of water properly disposed at the licensed POTW and as determined by manifests or invoices provided to the PROFESSIONAL by the CONTRACTOR. Payment shall be based on the unit price as completed on the bid form upon receipt of copies of the manifests or invoice signed by the POTW. CONTRACTOR will not be entitled to adjustment in unit prices as a result of change in estimated quantity under this line item and agrees to accept the unit prices accepted in the Bid as complete and total compensation for additions or deletions caused by changes or alterations of the Work.
- M. Item 13 – Water Treatment: Spent Media Replacement and Disposal:
1. Description: Item 13 includes labor, equipment, materials, supplies, and transport activities required to purchase new media and replace spent media from both lead and lag vessels (as applicable) in the onsite pre-treatment system as directed by the OWNER or PROFESSIONAL based on results of discharge monitoring and sampling. This pay item also includes all required waste characterization, manifesting, and disposal of replacement media and all other associated work and expenses incidental thereto.
 2. Measurement and Payment: Measurement shall be based on completion of spent media replacement and disposal directed by the OWNER or PROFESSIONAL as documented in field reports, recorded by PROFESSIONAL, and documented on copies of manifest signed by the disposal facility. Payment shall be based on the unit price per event as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for spent media replacement and disposal.
- N. Item 14 – Dredging:
1. Description: Item 14 includes providing all labor, equipment, materials, expenses, coordination, and transport for dredging and segregating impacted sediments to the limits shown in the drawings. Item 14 also includes transport of dredged material from the removal area to the upland sediment dewatering area and protection of all existing utilities and buildings during completion of dredging.
 2. Measurement and Payment: Measurement shall be based on in-situ cubic yardage of materials removed as required by the scope of Work and as determined by bathymetric survey made by CONTRACTOR and reviewed by the PROFESSIONAL. Pre- and post-excavation survey data will be used for computing the volume of material dredged from the source areas by the TIN subtraction method. Dredging outside of the limits presented on the Drawings, additional dredging not directed by the PROFESSIONAL, or dredging to compensate for sloughing, caving, or sloping of banks, as necessary, to facilitate removal

within the dredging limits shall not be included in the measurement. As such, any anticipated costs for such removal should be included in the bid cost. Payment shall be based on the unit price per cubic yard as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for performing dredging.

O. Item 15 – Additional Dredge Passes:

1. Description: Item 15 includes providing all labor, equipment, materials, expenses, coordination, and transport for dredging and segregating impacted sediments directed by the PROFESSIONAL based on results of confirmation sampling. Item 15 also includes transport of dredged material from the removal area to the upland sediment dewatering area and protection of all existing utilities and buildings during completion of dredging.
2. Measurement and Payment: Measurement shall be based on in-situ cubic yardage of materials removed as required by the scope of Work and as determined by bathymetric survey made by CONTRACTOR and reviewed by the PROFESSIONAL. Pre- and post-excavation survey data will be used for computing the volume of material dredged from the source areas by the TIN subtraction method. Dredging outside of the limits presented on the Drawings, additional dredging not directed by the PROFESSIONAL, or dredging to compensate for sloughing, caving, or sloping of banks, as necessary, to facilitate removal within the dredging limits shall not be included in the measurement. As such, any anticipated costs for such removal should be included in the bid cost. Payment shall be based on the unit price per cubic yard as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for performing dredging. CONTRACTOR will not be entitled to adjustment in unit prices as a result of change in estimated quantity under this line item and agrees to accept the unit prices accepted in the Bid as complete and total compensation for additions or deletions caused by changes or alterations of the Work.

P. Item 16 – Sediment Dewatering and Solidification:

1. Description: Item 16 includes all labor, materials, equipment, and supplies for managing sediment at the dewatering area and dewatering/solidifying sediment to meet disposal facility requirements in accordance with Section 02 61 10. Item 16 includes material costs for addition of up to 10% drying agent (by weight) as detailed in Section 02 61 10.
2. Measurement and Payment: Measurement shall be based the quantity of sediment dredged under Items 14 and 15. Payment shall be based on the unit price per cubic yard as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for sediment dewatering and solidification.

Q. Item 17 – Additional Drying Agent:

1. Description: Item 17 includes materials costs for additional drying agent (i.e., amount of drying agent above 10% by weight as approved by PROFESSIONAL) performed as required to meet disposal facility requirements in accordance with Section 02 61 10.
2. Measurement and Payment: Measurement shall be based tons of additional drying agent used as documented on the daily reports prepared by the CONTRACTOR and submitted to the PROFESSIONAL in accordance with Section 02 61 10. Payment shall be based on the unit price per ton of additional drying agent as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for completion of this task. CONTRACTOR will not be entitled to adjustment in unit prices as a result of change in estimated quantity under this line item and agrees to accept the unit prices accepted in the Bid as complete and total compensation for additions or deletions caused by changes or alterations of the Work.

R. Item 18 – Handling and Disposal of TSCA Material:

1. Description: Item 18 includes all labor, equipment, materials, and supplies necessary to load, transport, and dispose of removed TSCA materials (dredged materials with total

- PCBs greater than 50 mg/kg dry weight) to an approved off-site, licensed waste disposal facility in accordance with Section 02 61 10. The CONTRACTOR shall perform all waste characterization sampling for transportation and disposal of the TSCA material in accordance with Section 02 61 10.
2. Measurement and Payment: Measurement shall be based on Tons (U.S.) of TSCA material removed and disposed properly from the site as determined by certified weigh scale tickets provided to the PROFESSIONAL by the CONTRACTOR. Payment shall be based on the unit price as completed on the bid form upon receipt of certified weigh scale tickets and copies of manifest signed by the disposal facility.
- S. Item 19 – Handling and Disposal of Non-TSCA Material:
1. Description: Item 19 includes all labor, equipment, materials, and supplies necessary to load, transport, and dispose of removed non-TSCA materials to an approved off-site, licensed waste disposal facility in accordance with Section 02 61 10. The CONTRACTOR shall perform all waste characterization sampling for transportation and disposal of the non-TSCA material in accordance with Section 02 61 10.
 2. Measurement and Payment: Measurement shall be based on Tons (U.S.) of non-TSCA material removed and disposed properly from the site as determined by certified weigh scale tickets provided to the PROFESSIONAL by the CONTRACTOR. Payment shall be based on the unit price as completed on the bid form upon receipt of certified weigh scale tickets and copies of manifest signed by the disposal facility.
- T. Item 20 – Handling and Disposal of Support Area and Access Road Materials.
1. Description: Item 20 includes removal, transportation, and disposal of support area and access road materials at the appropriate approved off-site, licensed waste disposal facility(ies) in accordance with Section 01 55 13.
 2. Measurement and Payment: Measurement shall be based on completion of support area and access road material disposal, including receipt of certified weigh scale tickets and manifests signed by the disposal facility. Lump sum payment will be full compensation for all labor, equipment, materials, and incidentals necessary for performing this task.
- U. Item 21 – Cover:
1. Description: Item 21 includes labor, equipment, materials, supplies, and transport activities required to furnish imported Cover Fill material required to install sediment cover in accordance with plans and specifications. This pay item also includes all required material testing and certifications, and all other associated work and expenses incidental thereto, for which payment is not provided under other items.
 2. Measurement and Payment: Measurement shall be based on in-situ cubic yardage of materials placed as required by the scope of Work and as determined by bathymetric survey made by CONTRACTOR and reviewed by the PROFESSIONAL. Post-dredging (pre-cover) and post-construction dredge survey data will be used for computing the volume of material placed within the cover areas by the TIN subtraction method. Placement of material outside of the limits specified or directed by the PROFESSIONAL, or placement of material to compensate for sloughing, caving, or sloping of banks, as necessary, shall not be included in the measurement. As such, any anticipated costs for such placement should be included in the bid cost. Payment shall be based on the unit price per cubic yard as completed on the Base Bid form and shall be full compensation for all labor, equipment, materials, and incidentals necessary for performing cover placement. CONTRACTOR will not be entitled to adjustment in unit prices as a result of change in estimated quantity under this line item and agrees to accept the unit prices accepted in the Bid as complete and total compensation for additions or deletions caused by changes or alterations of the Work.
- V. Item 22 – Demobilization:

1. Item 22 includes decontamination (as appropriate) and demobilization of CONTRACTOR's equipment, tools, incidentals, and temporary facilities specified and required to complete the Work.
 2. Measurement and Payment: Measurement shall be based on completion of the CONTRACTOR's demobilization to the site. Lump sum payment for Item 22 will be full compensation for all labor, equipment, materials, and incidentals necessary for decontaminating (as necessary) and demobilizing the CONTRACTOR's equipment, tools, incidentals, and temporary facilities specified and required to complete the Work.
- W. Item 23 – Additional Quantities, in accordance with Section 01 21 00:
1. Description: Item 23 is a provisional allowance for additional quantities for the established pay items with unit pricing as necessary for completion of the Work as specified and as directed by the PROFESSIONAL and/or OWNER. CONTRACTOR shall obtain approval in writing by the PROFESSIONAL and/or the OWNER before incurring additional quantities in accordance with Section 01 21 00.
 2. Measurement and Payment: Measurement and payment shall be as established for the unit price items as specified in this Section, and the unit price shall be paid based on the price established on the Base Bid form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 13

PROJECT COORDINATION

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall coordinate the Work, including testing agencies whether hired by CONTRACTOR, OWNER, or others; Subcontractors, Suppliers, and others with whom coordination is necessary, in accordance with the General Conditions, Supplementary Conditions, and this Section, to perform the Work within the Contract Times and in accordance with the Contract Documents.
 - 2. Before beginning Work, CONTRACTOR must coordinate with the OWNER to implement the schedule for the Project. Once the Project is started, it must be carried to completion without delay.
- B. Coordination:
 - 1. In accordance with the General Conditions as may be modified by the Supplementary Conditions, CONTRACTOR shall cooperate with and coordinate the Work with other contractors, utility owners, utility service companies, OWNER's and facility manager's employees working at the Site, and other entities working at the Site.
 - 2. CONTRACTOR will not be responsible or liable for damage unless damage is through negligence of CONTRACTOR, or Subcontractors, Supplier, or other entity employed by CONTRACTOR.
 - 3. Attend and participate in all project coordination and progress meetings, and report on the progress of the Work and compliance with the Progress Schedule.
- C. Layout and Coordination Drawings:
 - 1. Maintain sufficient competent personnel, drafting and computer-aided drafting/design (CADD) equipment, software, systems, and supplies for preparing layout drawings, coordination drawings, and record documents in a timely manner.
 - 2. With the Contract Documents and Shop Drawings, use such coordination drawings as tools for coordinating the Work of various trades.
 - 3. Where such coordination drawings are to be prepared by other Subcontractors, ensure that each Subcontractor maintains required personnel and facilities at the Site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 15

RESIDENT PROJECT REPRESENTATIVE

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
1. This Section identifies the responsibilities and authority of the PROFESSIONAL's on-Site Resident Project Representative (RPR).

1.2. RESIDENT PROJECT REPRESENTATIVE

- A. General:
1. The RPR will act as directed by and under the supervision of PROFESSIONAL, and will confer with PROFESSIONAL regarding RPR's actions.
 2. RPR's dealings in matters pertaining to the Work shall, in general, be with the PROFESSIONAL, MDEQ Site Manager, and CONTRACTOR.
 3. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of CONTRACTOR.
 4. RPR shall generally communicate with OWNER with the knowledge of and under the direction of PROFESSIONAL.
- B. Duties and Responsibilities of RPR:
1. Schedules:
 - a. Review the progress schedule and schedule of values prepared by CONTRACTOR, and consult with PROFESSIONAL concerning acceptability of same.
 2. Conferences and Meetings:
 - a. Attend meetings with PROFESSIONAL, MDEQ Site Manager, and CONTRACTOR, such as pre-work conferences, progress meetings, job conferences, and other project-related meetings, and prepare and circulate copies of meeting minutes thereof.
 3. Liaison:
 - a. Serve as PROFESSIONAL's liaison with CONTRACTOR, working principally through CONTRACTOR's superintendent, and assist CONTRACTOR with understanding the intent of the Contract Documents; and assist PROFESSIONAL in serving as OWNER's liaison with CONTRACTOR when CONTRACTOR's operations affect OWNER's on-site operations.
 - b. Assist in obtaining from OWNER additional details or information, when required for proper execution of the Work.
 4. Review of Work, Rejection of Defective Work, Inspections, and Tests:
 - a. Conduct on-site observations of the Work in progress to assist PROFESSIONAL and MDEQ Site Manager in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - b. Perform the sampling and testing activities detailed in the Operations Monitoring and Maintenance (OM&M) Plan to be prepared by the PROFESSIONAL as part of the pre-mobilization activities. The OM&M Plan will describe monitoring and maintenance that will be conducted during remedial activities by the PROFESSIONAL, including:
 - 1) Sediment Confirmation Sampling.
 - 2) Water Column Monitoring.
 - 3) Community Air Monitoring.
 - c. Report to PROFESSIONAL and MDEQ Site Manager whenever RPR believes that any Work is unsatisfactory, faulty, or defective, or does not conform to the Contract

- Documents; or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise PROFESSIONAL and MDEQ Site Manager of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
- d. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work, record the results of these inspections, and report to PROFESSIONAL and MDEQ Site Manager.
- 5. Interpretation of Contract Documents:
 - a. Report to PROFESSIONAL when clarifications and interpretations of the Contract Documents are needed and transmit to CONTRACTOR clarifications and interpretations as issued by PROFESSIONAL.
 - 6. Records:
 - a. Maintain orderly files for correspondence, reports of job conferences, Shop Drawings and Samples, and reproductions of original Contract Documents including all Addenda, Change Orders, and Field Orders, additional Drawings issued subsequent to the execution of the Agreement, PROFESSIONAL's clarifications and interpretations of the Contract Documents, progress reports, and other Project-related documents.
 - b. Keep a record, recording CONTRACTOR hours on the job site, weather conditions, data relative to questions on Change Orders or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to PROFESSIONAL.
 - c. Record names, addresses, and telephone numbers of CONTRACTOR, all subcontractors, and all major suppliers of materials and equipment.
 - 7. Reports:
 - a. Furnish PROFESSIONAL and MDEQ Site Manager periodic reports as required of progress of the Work and of CONTRACTOR's compliance with the progress schedule.
 - b. Consult with PROFESSIONAL and MDEQ Site Manager in advance of scheduled major tests, inspections, or start of important phases of the Work.
 - c. Report immediately to PROFESSIONAL and OWNER upon the occurrence of any accident.
 - 8. Payment Requests:
 - a. Review applications for payment with CONTRACTOR for compliance with the established procedure for their submission and submit recommendations to PROFESSIONAL, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
 - 9. Completion:
 - a. Before PROFESSIONAL issues a Certificate of Substantial Completion, submit to CONTRACTOR a list of observed items requiring completion or correction.
 - b. Conduct final inspection in the company of PROFESSIONAL, OWNER, and CONTRACTOR, and prepare a final list of items to be completed or corrected.
 - c. Observe that all items on final list have been completed or corrected and make recommendations to OWNER concerning acceptance.
- C. Limitations of Authority of RPR:
- 1. RPR shall not:
 - a. Authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by OWNER.
 - b. Exceed limitations of PROFESSIONAL's authority as set forth in the Agreement or the Contract Documents.
 - c. Undertake any of the responsibilities of CONTRACTOR, subcontractors, or CONTRACTOR's superintendent.

- d. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences, or procedures of the Work, unless such advice or directions are specifically required by the Contract Documents.
- e. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
- f. Authorize OWNER to occupy the Project in whole or in part.
- g. Participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall attend and participate in all project coordination and progress meetings, including: but not limited to:
 - a. Pre-construction conference.
 - b. Progress meetings held throughout the Project.
 - 2. CONTRACTOR shall attend each project meeting prepared to discuss in detail all items on the agenda.
 - 3. PROFESSIONAL will distribute an agenda, preside at project meetings, and will prepare and distribute minutes of project meetings to all meeting participants and others as requested.

1.2. REQUIRED ATTENDEES

- A. Representative of each entity attending project meetings shall be authorized to act on that entity's behalf.
- B. CONTRACTOR Attendance: Meetings shall be attended by CONTRACTOR's:
 - 1. Project manager.
 - 2. Site superintendent.
 - 3. Safety representative.
 - 4. Representatives for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.
- C. PROFESSIONAL Attendance: Meetings will be attended (in person or via teleconference) by PROFESSIONAL's:
 - 1. Project manager or designated representative.
 - 2. Resident Project Representative (if any).
 - 3. Others as required by PROFESSIONAL.
- D. Other attendees that may attend the meeting in person or via teleconference will be representatives of:
 - 1. OWNER.
 - 2. Authorities having jurisdiction over the Work, if available.
 - 3. Utility owners, as applicable.
 - 4. Others as requested by OWNER, CONTRACTOR, or PROFESSIONAL.

1.3. PRE-CONSTRUCTION CONFERENCE

- A. General
 - 1. The Project Director will schedule a pre-construction conference to be attended by the PROFESSIONAL, OWNER, and CONTRACTOR.
 - 2. A project procedure as outlined in Form DTMB-0460, will be established for the Work during the pre-construction meeting.
 - 3. When no organizational meeting is called, CONTRACTOR, before beginning any Work, must meet with the staff of the Agency and arrange a Work schedule for the Project.
 - 4. Once the Project has started, CONTRACTOR must carry it to completion without delay.

1.4. PROGRESS MEETINGS

A. General:

1. PROFESSIONAL will schedule progress meetings to be held on the job site whenever needed to supply information necessary to prevent job interruptions, to observe the Work or to inspect completed Work.
2. CONTRACTOR must be represented at each progress meeting by persons with full authority to act for CONTRACTOR in regard to all portions of the Work.
3. Location:
 - a. CONTRACTOR's field office at the Site or other location mutually agreed upon by OWNER, CONTRACTOR, and PROFESSIONAL.

B. Preparation for Progress Meetings:

1. CONTRACTOR shall bring to each progress meeting one copy of each of the following handouts for each participant:
 - 1) List of Work accomplished since the previous progress meeting.
 - 2) Up-to-date Progress Schedule.
 - 3) Up-to-date Schedule of Submittals.
 - 4) Detailed "look-ahead" schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the OWNER, Project, and Site.
 - 5) When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

C. Agenda:

1. Preliminary Agenda: CONTRACTOR shall be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by PROFESSIONAL during the Project as required.
 - a. Safety Moment and Discussion of Incidents (as applicable).
 - b. Review, comment, and amendment (if required) of minutes of previous progress meeting.
 - c. Review of progress since the previous progress meeting.
 - d. Planned progress through next progress meeting.
 - e. Review of Progress Schedule.
 - f. Submittals.
 - g. Contract Modifications.
 - h. Problems, conflicts, and observations.
 - i. Quality standards, testing, and inspections.
 - j. Coordination between parties.
 - k. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
 - l. Permits.
 - m. Record documents status.
 - n. Punch list status, as applicable.
 - o. Other business.
 - p. Next meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 16

PROGRESS SCHEDULE

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. Prepare and submit Progress Schedules in accordance with the General Conditions (as may be modified by the Supplementary Conditions) and this Section, unless otherwise accepted by OWNER and PROFESSIONAL.
 - 2. Maintain and update Progress Schedules. Submit updated Progress Schedules as specified in this Section unless otherwise directed by PROFESSIONAL.
 - 3. PROFESSIONAL's acceptance of the Progress Schedule, and comments or opinions concerning the activities in the Progress Schedule shall not control CONTRACTOR's independent judgment relative to means, methods, techniques, sequences, and procedures of construction. CONTRACTOR is solely responsible for complying with the Contract Times.

1.2. SUBMITTALS

- A. Progress Schedules:
 - 1. Submit interim Rev. 0 Progress Schedule in accordance with the Contract Documents. Submit in accordance with Section 01 33 00, Submittal Procedures.
 - 2. After making revisions in accordance with PROFESSIONAL's comments on the interim Rev.0 As-Planned Progress Schedule, submit the Rev 0. Progress Schedule in accordance with Paragraph 8.2 of the General Conditions. Submit in accordance with Section 01 33 00, Submittal Procedures.
 - 3. Submit updated Progress Schedule at each progress meeting. If a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect. For monthly Progress Schedule submittals, bring to progress meeting the number of printed copies of the updated Progress Schedule specified in Section 01 31 19, Progress Meetings, and formally submit in accordance with Section 01 33 00, Submittal Procedures.
 - 4. Furnish each Progress Schedule submittal with letter of transmittal complying with requirements of Section 01 33 00, Submittal Procedures, and specifically indicating the following:
 - a. Listing of activities and dates that have changed since the previous Progress Schedule submittal.
 - b. Discussion of problems causing delays, anticipated duration of delays, and proposed countermeasures.
- B. Recovery Schedules: Submit in accordance with this Section, and other provisions of the Contract Documents.

1.3. PROGRESS SCHEDULE FORMAT AND CONTENT

- A. Format:
 - 1. Type: Horizontal bar chart or Gantt chart.
 - 2. Time Scale: Indicate first date of each work week.
 - 3. Organization:
 - a. Indicate on the separate Schedule of Submittals dates for submitting and reviewing Shop Drawings, Samples, and other submittals.

- b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
 - c. Group construction into a separate sub-schedule (that is part of the Progress Schedule) by activity.
 - d. Group critical activities that dictate the rate of progress (the “critical path”) into a separate sub-schedule that is part of the Progress Schedule. Clearly indicate the critical path on the Progress Schedule.
 - e. Organize each sub-schedule by Specification Section number.
- 4. Activity Designations: Indicate title and related Specification Section number.
- B. Content: Progress Schedules shall indicate the following:
 - 1. Dates for shop-testing.
 - 2. Delivery dates for materials and equipment to be incorporated into the Work.
 - 3. Dates for beginning and completing each phase of the Work by activity and by trade.
 - 4. Dates corresponding to the Contract Times, and planned completion date associated with each Milestone (if any), Substantial Completion, and readiness for final payment.
- C. Coordinate the Progress Schedule with the Schedule of Submittals.

1.4. RECOVERY SCHEDULES

- A. Recovery Schedules – General:
 - 1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls behind schedule, and the delay is within the control of CONTRACTOR, and there is no corresponding Change Order or Work Change Directive to support an extension of the Contract Times, CONTRACTOR shall prepare and submit a Progress Schedule demonstrating CONTRACTOR’s plan to accelerate the Work to achieve compliance with the Contract Times (“recovery schedule”) for OWNER’s and PROFESSIONAL’s acceptance.
 - 2. Submit recovery schedule within 15 days after submittal of updated Progress Schedule where need for recovery schedule is indicated.
- B. Implementation of Recovery Schedule:
 - 1. At no additional cost to OWNER, do one or more of the following: furnish additional resources (additional workers, additional construction equipment, increased work hours or additional shifts, and other resources), provide suitable materials, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
 - 2. Upon acceptance of recovery schedule by OWNER and PROFESSIONAL, incorporate recovery schedule into the next Progress Schedule update.
- C. Lack of Action:
 - 1. CONTRACTOR’s refusal, failure, or neglect to take appropriate recovery action, or to submit a recovery schedule, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall prepare and furnish submittals in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section.
 - 2. Provide submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of materials and equipment and to implement procedures following PROFESSIONAL's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.
 - 3. CONTRACTOR is responsible for dimensions to be confirmed and corrected at the Site; quantities; information pertaining solely to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.
 - 4. CONTRACTOR's signature of submittal's stamp and letter of transmittal shall be CONTRACTOR's representation that CONTRACTOR has complied with his obligations under the Contract Documents relative to that submittal. PROFESSIONAL and OWNER shall be entitled to rely on such representations by CONTRACTOR.
 - 5. Provisions of the General Conditions, as may be modified by the Supplementary Conditions, apply to all CONTRACTOR-furnished submittals required by the Contract Documents, regardless of whether such submittals are other than Shop Drawings or Samples.

1.2. TYPES OF SUBMITTALS

- A. Shop Drawings
 - 1. Shop drawings include work plans, samples, supporting vendor information, calculations, test reports, custom-prepared data such as fabrication and erection/installation (working) drawings, schedules for carrying out the work, setting diagrams, actual shop work manufacturing instructions, custom templates, coordination drawings, individual system or equipment inspection and test reports (including performance curves and certifications) as applicable to the work.
 - 2. Shop drawings shall not be submitted by subcontractors and shall only be submitted to the PROFESSIONAL once CONTRACTOR has verified submittals are complete. CONTRACTOR is responsible for submission at the proper time to prevent work delays.
 - 3. Details on shop drawings shall clearly show the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements. Such measurements shall be made and noted on the shop drawings before being submitted.
 - 4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the shop drawings before being submitted.
 - 5. Any shop drawings submitted via facsimile or that are otherwise illegible will be rejected.
- B. Product Data
 - 1. Product data include standard prepared data for manufactured products (sometimes referred to as catalog data), such as manufacturer's product specifications and

installation instructions, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection/test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples include physical examples of the work, such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, and units of work to be used by the OWNER/PROFESSIONAL for independent inspection and testing, as applicable to the work.

1.3. REQUIREMENTS FOR SCHEDULE OF SUBMITTALS

A. Timing:

1. Furnish submittal within time frames indicated in the Contract Documents.
2. Submit updated Schedule of Submittals with each submittal of the updated Progress Schedule.

B. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path. Indicate the following for each submittal:

1. Date by which submittal will be received by PROFESSIONAL.
2. Whether submittal will be for a substitution or "or-equal". Procedures for requesting approval of substitutes and "or-equals" are specified in the General Conditions.
3. Date by which PROFESSIONAL's response is required. Not less than 15 days, or as otherwise specified, shall be allowed for PROFESSIONAL's review, starting upon PROFESSIONAL's actual receipt of each submittal. Allow increased time for large or complex submittals.
4. For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors, if any.

C. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules in Section 01 32 16, Progress Schedule.

D. Coordinate Schedule of Submittals with the Progress Schedule.

E. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that that places extraordinary demands on PROFESSIONAL for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

F. In preparing Schedule of Submittals:

1. Considering the nature and complexity of each submittal, allow sufficient time for review and revision.
2. Reasonable time shall be allowed for: PROFESSIONAL's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to CONTRACTOR.
3. Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.4. PROCEDURE FOR SUBMITTALS

- A. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.

1. Submittal Number: Shall be separate and unique number correlating to each individual submittal required. Assign submittal numbers as follows:
 - a. First part of submittal number shall be the applicable Specifications Section number, followed by a hyphen.
 - b. Second part of submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal furnished under the associated Specifications Section.
 - c. Typical submittal number for the third submittal furnished for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
2. Review Cycle Number: Shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:
 - a. "A" = Initial (first) submittal.
 - b. "B" = Second submittal (e.g., first re-submittal).
 - c. "C" = Third submittal (e.g., second re-submittal).
3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	A
Second review cycle (first re-submittal) of third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	B

- B. Letter of Transmittal for Submittals:

1. Furnish separate letter of transmittal with each submittal. Each submittal shall be for one Specifications Section.
2. At beginning of each letter of transmittal, include a reference heading indicating: CONTRACTOR's name, OWNER's name, Project name, Contract designation, transmittal number, and submittal number.
3. For submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

- C. CONTRACTOR's Review and Stamp:

1. CONTRACTOR's Review: Before transmitting submittals to PROFESSIONAL, review submittals to:
 - a. Ensure proper coordination of the Work;
 - b. Determine that each submittal is in accordance with CONTRACTOR's desires;
 - c. Verify that submittal contains sufficient information for PROFESSIONAL to determine compliance with the Contract Documents.
2. Incomplete or inadequate submittals will be returned without review.
3. CONTRACTOR's Stamp and Signature:
 - a. Each submittal furnished shall bear CONTRACTOR's stamp of approval and signature, as evidence that submittal has been reviewed by CONTRACTOR and verified as complete and in accordance with the Contract Documents.
 - b. Submittals without CONTRACTOR's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated submittal will be returned without review.
 - c. CONTRACTOR's stamp shall contain the following:

"Project Name: _____
 Contractor's Name: _____
 Contract Designation: _____
 Date: _____

----- Reference -----

Submittal Title: _____
 Specifications:
 Section: _____
 Page No.: _____
 Paragraph No.: _____
 Drawing No.: _____ of _____
 Location of Work: _____
 Submittal No. and Review Cycle: _____
 Coordinated by Contractor with Submittal Nos.: _____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this submittal.

Approved for Contractor by: _____"

D. Submittal Marking and Organization:

1. Mark on each page of submittal and each individual component submitted with submittal number and applicable Specifications paragraph.
2. Arrange submittal information in same order as requirements are written in the associated Specifications Section.
3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to PROFESSIONAL.
4. Package together submittals for the same Specifications Section. Do not furnish required information piecemeal.

E. Format of Submittal and Recipients:

1. Electronic Submittals:
 - a. Format: Electronic files shall be in "portable document format" (.PDF). Files shall be electronically searchable.
 - b. Organization and Content:
 - 1) Each electronic submittal shall be one file; do not divide individual submittals into multiple files each.
 - 2) When submittal is large or contains multiple parts, furnish PDF file with bookmark for each section of submittal.
 - 3) Content shall be identical to printed submittal. First page of electronic submittal shall be CONTRACTOR's letter of transmittal.
 - c. Quality and Legibility: Electronic submittal files shall be made from the original and shall be clear and legible. Do not submit scans of faxed copies. Electronic file shall be full size of original, printed documents. Properly orient all pages for reading on a computer screen.
 - d. Provide sufficient Internet service and e-mail capability for CONTRACTOR's use in transferring electronic submittals, receiving responses to electronic submittals, and associated electronic correspondence. Check not less than once per day for distribution of electronic submittals, electronic responses to submittal, and electronic correspondence related to submittals.
 - e. Submitting Electronic Files:

- 1) Transmit electronic submittals files via e-mail in with the distribution list determined during the pre-construction conference and as amended during the Project.
 2. Samples:
 - a. Securely label or tag Samples with submittal identification number. Label or tag shall include clear space at least four inches by four inches in size for affixing PROFESSIONAL's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.
 - b. Submit quantity of Samples required in Specifications. If quantity of Samples is not indicated in the associated Specifications Section, furnish not less than (--1--) identical Samples of each item required for PROFESSIONAL's approval. Samples will not be returned to CONTRACTOR. If CONTRACTOR requires Sample(s) for CONTRACTOR's use, so advise PROFESSIONAL in writing and furnish additional Sample(s). CONTRACTOR is responsible for furnishing, shipping, and transporting additional Samples.
 - c. Deliver one Sample to PROFESSIONAL's field office at the Site. Deliver balance of Samples to PROFESSIONAL at address indicated in Table 01 33 00-A, unless otherwise directed by PROFESSIONAL.
- F. Record Documentation: Submit in accordance with Section 01 78 39, Project Record Documentation.
- G. Resubmittals: Refer to the General Conditions for requirements regarding resubmitting required submittals.

1.5. PROFESSIONAL'S REVIEW

- A. Timing: PROFESSIONAL's review will conform with timing indicated in the Schedule of Submittals reviewed by PROFESSIONAL.
- B. Results of PROFESSIONAL's Review: Each submittal will be given one of the following dispositions by PROFESSIONAL:
1. Reviewed ("R"): Upon return of submittal marked "Reviewed", order, ship, or fabricate materials and equipment included in the submittal or otherwise proceed with the Work in accordance with the submittal and the Contract Documents.
 2. Reviewed and Noted ("N"): Upon return of submittal marked "Reviewed and Noted", order, ship, or fabricate materials and equipment included in the submittal or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, and in accordance with the corrections indicated in the PROFESSIONAL's submittal response.
 3. Resubmit ("S"): Upon return of submittal marked "Resubmit", make the corrections indicated and re-submit to PROFESSIONAL for review.
 4. Rejected ("J"): This disposition indicates material or equipment does not meet the intent of the design. "Rejected" disposition may also be applied to submittals that are incomplete. Upon return of submittal marked "Rejected", repeat initial submittal procedure utilizing acceptable material or equipment, with a complete submittal clearly indicating all information required.
 5. For Information Only ("I"): "For Information Only" is assigned to acknowledge receipt of a submittal that does not require the PROFESSIONAL's review and is being filed for informational purposes only. "I" is generally used in acknowledging receipt of the following:
 - a. Health and Safety Plans.
 - b. Safety data sheets (SDSs).
 - c. Manufacturer's instructions.
 - d. Administrative submittals.

- e. Additional information not required by the Contract Documents or requested by PROFESSIONAL/OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. ATTACHMENTS

- A. The documents listed below, following the "End of Section" designation, are part of this Specification Section.
 - 1. "Submittal Log" (3 pages).

END OF SECTION

SUBMITTAL LOG

Section No.	Item Description	Submittal Number	New / Resub	Date Received	Reviewer	Date Returned	Review Status¹
01 11 00	Operations Plan						
01 11 00	Contingency Plan						
01 32 16	Interim Rev. 0 Progress Schedule						
01 32 16	Rev. 0 Progress Schedule						
01 32 16	Progress Schedule Updates						
01 32 16	Recovery Schedule						
01 35 29	Contractor's HASP						
01 35 29	Health and Safety Reports						
01 35 29	Accident Reports						
01 35 44	SPCC Evaluation						
01 35 44	SPCC Plan (when required)						
01 35 44	SPCC Plan Distribution List						
01 35 44	SPCC Qualification Statement						
01 45 00	Quality Control Submittals and Test Reports						
01 45 00	Testing Laboratory Qualifications Statements						
01 55 13	Support Area Layout						
01 57 00	Turbidity and Sheen Control Plan						
01 57 00	Odor, Dust, and Vapor Control Plan						
01 57 00	Noise Control Plan						
01 57 00	Pollution Control Plan						
01 57 00	Traffic Control Plan						
01 57 00	Water Diversion Control Plan						
01 57 00	Vapor/Odor Mitigation Agents and Equipment						
01 57 00	Turbidity Curtain System Materials						
01 57 00	Oil Absorbent Booms						
01 57 00	Turbidity Curtain Shop Drawings						
01 58 00	Project Identification Shop Drawing						
01 58 00	Initial Weekly Report						
01 71 23	Daily Reports						
01 71 23	Field Engineering Accuracy Documentation						
01 71 23	Survey Plan						

¹ Review Status Designated as Follows:

R = Reviewed

N = Reviewed and Noted

S = Resubmit

J = Rejected

I = For Information Only

SUBMITTAL LOG

Section No.	Item Description	Submittal Number	New / Resub	Date Received	Reviewer	Date Returned	Review Status¹
01 71 23	Survey Results						
01 71 23	Certification of Survey						
01 71 23	Field Supervisor Qualifications Statements						
01 71 23	Surveyor Qualifications Statements						
01 78 39	Record Documents						
02 61 10	Material Handling and Disposal Plan						
02 61 10	Waste Manifests						
02 61 10	Waste Handling Daily Reports						
02 61 10	Shipping Receipts						
02 61 10	Waste Disposal Certifications						
02 73 00	Wastewater Treatment Work Plan						
02 73 00	Wastewater Treatment Operations Training Plan						
02 73 00	List of Trained Staff and Responsibilities						
02 73 00	Initial Startup and Testing Report						
02 73 00	Written Record of Operation and Maintenance Activities						
02 73 00	Pre-Treatment System Effluent Data						
02 73 00	Wastewater Treatment and Wastewater Management Monitoring Data						
02 73 00	Pre-Treatment System Field Notes						
31 05 15	Laboratory Qualifications Statements						
31 05 15	Quality Assurance Test Results Submittals						
31 05 15	General Fill Product Data, including gradation results, optimum moisture/density, supplier source, and certification						
31 05 15	Cover Fill Product Data, including gradation results, optimum moisture/density, supplier source, and certification						
31 05 15	Cover Fill Analytical Data						
31 05 19	Non-Woven Geotextile - Manufacturer's Data and Specifications						
31 05 19	Woven Geotextile - Manufacturer's Data and Specifications						
31 05 19	Geomembrane - Manufacturer's Data and Specifications						

SUBMITTAL LOG

Section No.	Item Description	Submittal Number	New / Resub	Date Received	Reviewer	Date Returned	Review Status¹
31 25 00	SESC Implementation Plan						
31 25 00	Copies of Permits						
32 60 00	Topsoil Data and Certification						
35 20 23	Dredging and Cover Work Plan						
35 20 23	Inspection Reports						
35 20 23	Pre-Construction Survey Results						
35 20 23	Daily Dredge Reports						
35 20 23	Misplaced Material Report						

SECTION 01 35 13

SPECIAL PROJECT PROCEDURES

PART 1 GENERAL

1.1. DESCRIPTION

- A. This Section includes the following Special Project Procedures that CONTRACTOR shall comply with in addition to the other requirements of the Contract Documents:
 - 1. Soil Erosion and Sedimentation Control (SESC) Project Procedures
 - 2. Hazardous Materials Project Procedures

1.2. SOIL EROSION AND SEDIMENTATION CONTROL PROJECT PROCEDURES FOR CONTRACTORS ON DTMB OWNED AND MANAGED PROPERTIES

- A. Contractor shall comply with Part 91, Soil Erosion and Sedimentation Control of the Natural Resources and Environmental Protection Act 1994 PA 451, as amended.
- B. Contractor shall contact DTMB, Design and Construction Division to discuss the implementation of soil erosion and sedimentation control (SESC) on the Project. Phone (517) 284-7911; Fax (517) 284-7971.
- C. Following the award of a contract, the Contractor shall prepare and submit for approval an "SESC Implementation Plan" and appropriate application fee to DTMB or the local enforcing agency if delegated by DTMB. Contractor shall also submit a copy of the SESC Implementation Plan to the Professional for information purposes.
- D. The Contractor's "SESC Implementation Plan" shall indicate the Contractor's intended implementation of SESC on the project including a schedule and sequence. Contractor shall refer to the "Checklist for Contractor's SESC Implementation Plan," in paragraph 3.1 of this Section, for details of the required information necessary for the Contractor to create the SESC Implementation Plan. The intent of the SESC Implementation Plan is to ensure that the Contractor has reviewed and understands the SESC provisions within the plans and specifications.
- E. The Environmental Health and Safety Section of DTMB, upon approval of the implementation plan, will issue to the Contractor an "Authorization to Proceed with Earth Change" document, which is to be posted at the job site. This document is issued in lieu of a permit from the county, unless DTMB delegates SESC permitting to the local enforcing agency.
- F. Upon receipt of an "Authorization to Proceed with Earth Change" or permit document, Contractor shall post a copy at the job site and submit a copy to the Professional within one business day. Earthwork shall not begin prior to receipt of this Authorization. Upon receipt of the SESC Authorization document, the Contractor may begin earth change activities.

1.3. HAZARDOUS MATERIALS PROJECT PROCEDURES

- A. CONTRACTOR must use, handle, store, dispose of, process, transport and transfer any material considered a Hazardous Material in accordance with all Federal, State and local Laws. If CONTRACTOR encounters material reasonably believed to be a Hazardous Material and which may present a substantial danger, CONTRACTOR must immediately stop all affected work, give written notice to the OWNER of the conditions encountered, and take appropriate health and safety precautions.

- B. This project has been identified by the DTMB-FBSA as having a possibility of containing Hazardous Waste materials to be legally removed from the Project job site in order to complete the Work as described in the Proposal And Contract.
- C. Environmental Hazards (air, water, land and liquid industrial) are handled by the Waste and Hazardous Materials Division, Michigan Department of Environmental Quality (MDEQ) in carrying out the requirements of the United States Environmental Protection Agency (USEPA). For general information and/or a copy of the latest regulations and publications call (517) 335-2690.
- D. The Michigan Occupational Safety and Health Administration provides protection and regulations for the safety and health of workers. The Department of Licensing and Regulatory Affairs provides for the safety of workers. The Department of Community Health provides for the health of workers (517/373-3740) (TDD 517/373-3573).
1. CONTRACTOR must post any applicable State and/or Federal government regulations at the job site in a prominent location.
 2. CONTRACTOR must be responsible for training their workers in safe work practices and in proper removal methods when coming in contact with hazardous chemicals.
- E. Applicable Regulations:
1. Natural Resources and Environmental Protection Act – PA 451 of 1994, as amended, including Part 111 – Hazardous Waste Management, Part 121 – Liquid Industrial Waste and Part 147 – PCB compounds.
 2. RCRA, 1976 - Resource Conservation and Recovery Act: This federal statute regulates generation, transportation, treatment, storage or disposal of hazardous wastes nationally.
 3. TSCA, 1979 – Toxic Substances Control Act: This statute regulates the generation, transportation, storage and disposal of industrial chemicals such as PCBs.
- F. Definitions: Hazardous substances are ignitable, corrosive, reactive, and/or toxic, based on their chemical characteristics.
1. Under Federal and Michigan Law, a Small Quantity Generator of hazardous waste provides from 220 to less than 2,000 lbs./month or never accumulates 2,200 lbs. or more.
 2. A Generator size provider of hazardous waste provides 2,200 lbs. or more/month or accumulates above 2,200 lbs.
- G. Disposals: To use an off-site hazardous waste disposal facility, CONTRACTOR must use the Uniform Hazardous Waste Manifest (shipping paper). Small quantities of hazardous waste may not be disposed of in sanitary landfills used for solid waste.
- H. Federal, State and local Laws and regulations may apply to the storage, handling and disposal of Hazardous Materials and wastes at each State Agency. Contact the Environmental Assistance Center of the Michigan Department of Environmental Quality (MDEQ) at 1-800-662-9278, Fax to: 517-241-0673 or e-mail to: DEQ-EAD-envassist@michigan.gov for general MDEQ information including direct and referral assistance on air, water and wetlands permits; contaminated site clean-ups; underground storage tank removals and remediation; hazardous and solid waste disposal; pollution prevention and recycling; and compliance-related assistance. The Center provides businesses, municipalities, and the general public with a single point of access to MDEQ's environmental programs.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1. ATTACHMENTS

- A. The documents listed below, following the “End of Section” designation, are part of this Specification Section.
 - 1. “Checklist for CONTRACTOR's SESC Implementation Plan” (one page). The Checklist includes details of the required information necessary for CONTRACTOR to create the SESC Implementation Plan and to ensure that CONTRACTOR has reviewed and understands the SESC provisions within the plans and specifications.

END OF SECTION

**CHECKLIST FOR CONTRACTOR'S SOIL EROSION AND SEDIMENTATION
CONTROL IMPLEMENTATION PLAN**

(For projects that include earth changes or disturb existing vegetation):

Prior to the start of earthwork, the Contractor must submit a Soil Erosion and Sedimentation Control (SESC) Implementation Plan to the Michigan Department of Technology, Management and Budget, Soil Erosion and Sedimentation Control Program. The intent of this plan is to ensure that the Contractor has reviewed and understands the SESC provisions within the plans and specifications. The following checklist will provide Contractors with assistance in creating the SESC Implementation Plan.

The SESC Implementation Plan must include:

PROJECT TITLE:

PROJECT LOCATION:

PROJECT FILE NUMBER:

INDEX NUMBER:

1. ☐ A written plan or letter demonstrating:
 - ☐ The Contractor's means and methods for the implementation of SESC provisions included within the plans and specifications and compliance with the provisions of Part 91 of PA 451 of 1994, as amended.
 - ☐ The Contractor's plan for dust control.
 - ☐ The Contractor's plan for inspection and maintenance of temporary SESC's.
2. ☐ A map, location plan, drawing, or amended copy of the Project SESC or grading plan showing:
 - ☐ The locations of any stockpiles of soil associated with the Project
 - ☐ The temporary SESC controls associated with stockpiles of soil
 - ☐ The Contractor's suggested or proposed additions or relocations of any temporary or permanent SESC measures associated with the Project plans and specifications (subject to approval by Professional and DTMB)
 - ☐ Location of site entrances, exits, and vehicle routes
 - ☐ Location of site superintendent's/project manager's site trailer or office (for SESC Inspector check-in)
3. ☐ A schedule for the installation and removal of temporary controls and the installation of permanent soil erosion and sedimentation controls in relation to the overall construction schedule.

Contractor shall submit the above items to the following address:

DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
FACILITIES AND BUSINESS SERVICES ADMINISTRATION,
DESIGN AND CONSTRUCTION DIVISION
SOIL EROSION AND SEDIMENTATION CONTROL PROGRAM
P.O. Box 30026, Lansing, Michigan 48909

Upon approval of the Contractor's plan, an "Authorization to Proceed with Earth Change" will be issued by DTMB, Design and Construction Division.

SECTION 01 35 29

CONTRACTOR'S HEALTH AND SAFETY PLAN

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall prepare and maintain a written, Site-specific, health and safety plan (HASP), and conduct all construction activities in safe manner that avoids:
 - a. Injuries to employees, Subcontractors, and other persons with an interest at or near the Site;
 - b. Employee exposures to health hazards above occupational limits established by Laws or Regulations, American Conference of Governmental Industrial Hygienists (ACGIH), and Nuclear Regulatory Commission (NRC), as applicable;
 - c. Exposure of the public and OWNER's employees to air contaminants above levels established for public exposure by the USEPA, NRC, and by other authorities having jurisdiction at the Site;
 - d. Significant increases in concentrations of contaminants in soil, water, or sediment near the Site; or
 - e. Violations of OSHA Regulations, or other Laws or Regulations.
- B. Any disregard of the provisions of the HASP may, without limitation, be deemed just and sufficient reason for termination of CONTRACTOR's services for cause.

1.2. QUALITY ASSURANCE

- A. Regulatory Requirements: CONTRACTOR's health and safety practices shall follow the standards and guidelines established in the following:
 - 1. 29 CFR 1904, OSHA, Record Keeping.
 - 2. 29 CFR 1910, OSHA, General Industry Standards.
 - 3. 29 CFR 1926, OSHA, Construction Industry Standards.
 - 4. 29 CFR 1926.65, OSHA, Hazardous Waste Operations and Emergency Response.
 - 5. 49 CFR 171.8, DOT, Hazardous Materials in Transport.
 - 6. 40 CFR Parts 261.3, 264 and 265, USEPA, Resource Conservation and Recovery Act.
 - 7. 40 CFR 761.79, USEPA, Toxic Substance Control Act (TSCA).
 - 8. 29 CFR 1910.146, OSHA, Permit-Required Confined Spaces.

1.3. SUBMITTALS

- A. Submit to PROFESSIONAL the following:
 - 1. CONTRACTOR's HASP.
 - 2. Health and safety reports.
 - 3. Accident reports.

1.4. GENERAL PROVISIONS

- A. Submit HASP to PROFESSIONAL one week prior to the Pre-Construction Conference, or 30 days prior to planned mobilization at the Site, whichever is sooner.
- B. The HASP shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of the HASP.

- C. PROFESSIONAL will review and either accept or return for revision CONTRACTOR's HASP in accordance with the Schedule of Submittals acceptable to PROFESSIONAL. PROFESSIONAL's review and acceptance will be only to determine if the topics covered by the HASP conform to the Contract Documents.
- D. PROFESSIONAL's review and acceptance will not extend to means, methods, techniques, procedures of construction, or to whether the representations made in the HASP comply with regulatory standards or standards of good practice.
- E. At the time of submittal, CONTRACTOR shall give PROFESSIONAL specific written notice of variations, if any, that the HASP may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the submittal; and, in addition, by a specific notation made on each submittal to PROFESSIONAL for review and acceptance of each such variation.
- F. No Work shall be performed on the Site until the written HASP has been accepted by the PROFESSIONAL.
- G. Notwithstanding any other provision of the Contract Documents, extensions to the Contract Times will not be granted if caused by undue delay by CONTRACTOR in developing or revising the HASP.
- H. CONTRACTOR shall be solely responsible for the supervision and enforcement of CONTRACTOR's HASP for its employees, Subcontractors, and site visitors.

1.5. WRITTEN HEALTH AND SAFETY PROGRAM

- A. Work in this Contract is for removing debris and PCB-impacted sediments from the Dredging Area(s); removing, characterizing, and disposing of impacted waste materials and construction wastewater; installation of cover (where required); and completing all site restoration.
- B. The HASP, which shall be kept on the Site, shall address the safety and health hazards of each phase of operations on the Site and include the requirements and procedures for employee protection. The HASP as a minimum, shall address and include the following:
 - 1. The organizational structure of CONTRACTOR's organization.
 - 2. A work plan.
 - 3. A safety and health risk or hazard analysis for each task and operation found in the work plan. The primary work tasks requiring analysis for this site and known Hazardous Environmental Conditions are included in Section 01 11 00, Summary of Work.
 - 4. Employee training assignments including copies of 40-hour, 24-hour Supervised Field Activities, 8-hour Supervisors, and 8-hour Refresher Training Certificates for all CONTRACTOR's employees assigned to the Project.
 - 5. Personal protective equipment to be used by employees for each of the tasks and operations being conducted. Respirator fit test certificates for all CONTRACTOR employees assigned to the Project.
 - 6. Medical Surveillance Requirements: Medical clearance certificates for all CONTRACTOR's employees assigned to the Project.
 - 7. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment.
 - 8. Site control measures for purposes, including but not limited to:
 - a. Preventing trespassing.
 - b. Preventing unqualified or unprotected workers from entering restricted areas.
 - c. Preventing tracking of contaminants out of the Site.
 - d. Maintaining log of employees on and visitors to the Site.
 - e. Delineating hot, cold and support zones.

- f. Locating personnel and equipment decontamination zones.
 - g. Communicating routes of escape and gathering points.
 - 9. Decontamination procedures.
 - a. Equipment used to handle TSCA material shall be decontaminated in accordance with 40 CFR 761.79 prior to handling non-TSCA material and prior to equipment demobilization.
 - 10. An emergency response plan for safe and effective responses to emergencies, including the necessary PPE and other equipment.
 - 11. Confined space entry procedures (if applicable).
 - 12. A spill containment program.

C. Organizational Structure:

- 1. The organizational structure part of the HASP shall refer to or incorporate information on the specific chain of command and specify the overall responsibilities of supervisors and employees, and shall include, at a minimum, the following elements:
 - a. Designation of a general supervisor who has the responsibility and authority to direct operations.
 - b. A Site safety and health supervisor who has the responsibility and authority to implement and modify the HASP and verify compliance.
 - c. All other personnel needed for Site operations and emergency response and their general functions and responsibilities.
 - d. The lines of authority, responsibility, and communication.
- 2. The organizational structure shall be reviewed and updated as necessary to reflect the current status of Site operations.

D. Transportation and Handling Plan:

- 1. The transportation and handling plan shall include information on:
 - a. Procedures that will be used to ensure safe waste handling during the excavating, handling, temporary staging, and storage, loading, and transporting activities.
 - b. Twenty-four hour telephone contact information in the event of an accident during waste transportation activities.

1.6. ACCIDENT REPORTING AND INVESTIGATION

- A. Document all accidents resulting in bodily injury using OSHA 301 form.
- B. Submit copies of completed OSHA 301 forms to the PROFESSIONAL weekly.
- C. Based upon the results of an accident investigation, make modifications to the HASP by changing tasks or procedures to prevent a reoccurrence.
- D. Post a copy of CONTRACTOR's OSHA 300A report in a conspicuous place onsite during the months of February, March, and April, if applicable.

1.7. DAILY HEALTH AND SAFETY FIELD REPORTS

- A. Submit to PROFESSIONAL daily health and safety field reports including, but not limited to, weather conditions and acknowledgment of deficiencies noted along with corrective actions taken on current and previous deficiencies. In addition, the daily health and safety air monitoring results, documentation of instrument calibration, new hazards encountered, and PPE utilized shall be included.
- B. The daily health and safety field reports shall include a description of problems, real or anticipated, encountered during the course of Work that should be brought to the attention of

the PROFESSIONAL and notification of deviations from planned Work shown in the previously submitted daily health and safety field report(s).

C. CONTRACTOR shall attach the daily health and safety field reports to the daily field reports.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 44

SPILL PREVENTION AND COUNTERMEASURES PLAN

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. This Section pertains to spill prevention control and countermeasures applicable to the Project under the provisions of 40 CFR 112 and other Laws and Regulations.
 - 2. CONTRACTOR shall provide all labor, materials, equipment, tools, professional services (when required), and incidentals as shown, specified, and required to comply with Laws and Regulations regarding spill prevention control and countermeasures (SPCC) planning and compliance, including 40 CFR 112.
 - 3. CONTRACTOR shall determine whether a SPCC Plan is required. If SPCC Plan is required, CONTRACTOR shall prepare, implement, and maintain SPCC Plan as required by Laws and Regulations.

1.2. DETERMINATION OF NEED FOR SPCC PLAN FOR PROJECT

- A. Determination of Need for SPCC Plan:
 - 1. CONTRACTOR shall determine need for SPCC Plan for the Project.
 - 2. CONTRACTOR's Professional Engineer:
 - a. If the Site will include storage of more than 10,000 gallons of oil in above-ground storage, or if the Site does not comply with oil discharge history criteria specified in 40 CFR 112, CONTRACTOR shall retain a qualified professional engineer to determine need for SPCC Plan for the Project and, if SPCC Plan is required, professional engineer shall prepare or supervise preparation of SPCC Plan for the Project.
 - b. If a professional engineer is not required to prepare the full SPCC Plan for the Project, but the SPCC Plan includes environmentally-equivalent SPCC measures, or impracticality determinations, CONTRACTOR shall retain a qualified professional engineer to prepare and certify those portions of the SPCC Plan dealing with environmentally equivalent measures and impracticality determinations; the balance of the SPCC Plan may be prepared by and be self-certified by CONTRACTOR.
 - c. Submit to PROFESSIONAL letter presenting results of evaluation of whether a SPCC Plan is required for the Project in accordance with Laws and Regulations.
- B. SPCC Plan is required when the Project activities at the Site meet the following criteria:
 - 1. The Site and activities thereon are not exempt from Laws and Regulations relative to SPCC planning and implementation.
 - 2. Oil is stored, used, transferred, or otherwise handled at the Site, unless otherwise exempted by Laws and Regulations.
 - 3. Maximum oil storage capacity at the Site equals or exceeds either of the following thresholds: 42,000 gallons of completely-buried capacity, or 1,320 gallons of above-ground capacity. Capacity includes total storage tank volume and operational storage volume at the Site for contractors and Subcontractors, including bulk storage tanks, containers with 55-gallon storage capacity and larger, mobile tanks located at the Site, and other containers covered by Laws and Regulations. Exempt are motive storage containers, such as those on construction equipment and vehicles. Oil includes petroleum products, fuel oil, hydraulic fluid, oil sludge, oil refuse, oil mixed with wastes other than dredged material, synthetic oil, vegetable oil, animal fats and oils, and other oils defined in Laws and Regulations.

4. There is reasonable expectation, based on location of the Site, that an oil spill would reach navigable waters of the United States or adjoining shorelines.
- C. When SPCC Plan is not required, CONTRACTOR shall ensure that conditions that preclude the need for SPCC Plan for the Project, including the activities of all contractors and Subcontractors working on the Project at the Site, are maintained throughout duration of the Project. Should changes that affect the storage, use, or handling of oil at the Site occur, reassess the need for SPCC Plan for the Project at no additional cost to OWNER and submit to PROFESSIONAL evaluation letter regarding need for SPCC Plan.

1.3. SPCC PLAN AND IMPLEMENTATION

- A. When SPCC Plan is required, develop SPCC Plan and submit for acceptance by OWNER, with copy to PROFESSIONAL. SPCC Plan shall be specific to the Site and the Project and shall include the following:
 1. Seal or stamp, original signature, and license number of CONTRACTOR'S professional engineer, when self-certification by CONTRACTOR is not allowed by Laws and Regulations.
 2. Site plan identifying the name (or tag number) and location of each tank and container that will contain a substance regulated in 40 CFR 112 and other Laws and Regulations, including above-ground and buried tanks. Site plan shall indicate general directions of storm water runoff, including storm sewers and drainage inlets (including arrows indicating directions of flow), and storm sewer outfall locations shown and labeled.
 3. For each tank and container shown or indicated on the Site plan, include a table that lists the tank or container's name and tag number, type of oil stored therein, and maximum storage capacity. List total storage capacity of all regulated tanks and containers at the Site covered by SPCC Laws and Regulations.
 4. Predictions of direction, rate of flow, and total quantity of oil that could be discharged from the Site as result of storage tank or container failure.
 5. Operating procedures that prevent oil spills, including procedures for oil handling, details of secondary containment structures at fuel and oil transfer areas, and details and descriptions of equipment to be used for oil handling, including piping.
 6. Control Structures and Secondary Containment:
 - a. Furnish details of and descriptions of control measures installed by CONTRACTOR to prevent spill from reaching navigable waters of the United States and associated shorelines, including secondary containment and diversionary structures.
 - b. For on-shore Sites, one of the following must be used, at minimum: dikes, berms, or retaining walls; curbing; culverts, gutters, or other drainage systems; weirs, booms, or other barriers; spill diversion ponds; retention ponds; or sorbent materials.
 - c. Where appropriate, the SPCC Plan shall clearly demonstrate that containment or diversionary structures or equipment are not practical.
 - d. Include brittle fracture evaluation, where required, for field-constructed above-ground storage containers undergoing repair, alteration, construction, or change in service.
 7. Plans for countermeasures to contain, clean up, and mitigate effects of oil spill that reaches navigable waters of the United States or their shorelines, including written commitment of manpower, equipment, and materials to quickly control and remove spilled oil. Include estimation of time required to contain spill after spill occurs.
 8. Contact list and telephone numbers for facility response coordinator, National Response Center, cleanup contractors, and all appropriate federal, state, and local authorities having jurisdiction to be contacted in event of spill or discharge.
 9. Program for monthly inspections of the Site by CONTRACTOR for SPCC Plan compliance. Advise OWNER in writing of each inspection not less than 72 hours in advance.
 10. Measures for Site security relative to oil storage.

11. Procedures for safely handling mobile containers such as totes, drums, and fueling vehicles and construction equipment that remain at the Site.
 12. Procedures and schedules for periodic testing of integrity of tanks and containers, and associated piping and valves.
 13. Plans for bulk storage container compliance.
 14. Plans for personnel training and oil spill prevention briefings.
 15. For SPCC Plans that do not follow the format listed in Laws and Regulations, provide cross-reference to requirements of Laws and Regulations, including 40 CFR 112.7.
- B. Obtain acceptance of SPCC Plan by OWNER, for coordination with OWNER's Site-specific SPCC Plan, if any.
- C. CONTRACTOR shall perform updates and revisions of the Project's SPCC Plan as necessary and submit same in accordance with the provisions of this Section for submittal and acceptance of initial SPCC Plan.
- D. Post a copy of accepted, certified SPCC Plan in conspicuous location at the Site and furnish copies to OWNER, PROFESSIONAL, other contractors, and Subcontractors as appropriate. All contractors shall comply with SPCC Plan.
- E. In event of violation of SPCC Plan or release of oils attributable to construction operations, CONTRACTOR shall:
1. Immediately issue notifications in accordance with Laws and Regulations, including 40 CFR 110 and 40 CFR 112. When required by Laws and Regulations, report to National Response Center, US Environmental Protection Agency, and other authorities having jurisdiction, if any.
 2. Have spill clean-up performed in accordance with Laws and Regulations, the SPCC Plan, and requirements of authorities having jurisdiction.
 3. Pay fines and civil penalties (or responsible portion thereof) imposed on OWNER by authorities having jurisdiction, and pay costs associated with clean-up of spills.
 4. Should cleanup of spills attributable to CONTRACTOR be necessary, no resulting change in the Contract Price or Contract Times will be allowed. Should CONTRACTOR share responsibility for spill and cleanup with another entity, changes in Contract Price and Contract Times, if any, will be proportionate.

1.4. QUALITY ASSURANCE

- A. Qualifications:
1. CONTRACTOR's Professional Engineer:
 - a. When required by Laws and Regulations, engage a licensed, registered professional engineer legally qualified to practice in the jurisdiction where the Site is located and experienced in performing engineering services of the type required.
 - b. Submit qualifications data.
 - c. Responsibilities include but are not necessarily limited to:
 - 1) Carefully reviewing Laws and Regulations relative to SPCC.
 - 2) Preparing written requests for clarifications or interpretations of criteria specified in the Contract Documents for submittal to PROFESSIONAL by CONTRACTOR, and obtaining from authorities having jurisdiction clarifications regarding Laws and Regulations as required.
 - 3) Preparing or supervising the preparation of letter-report evaluation of need for SPCC Plan in accordance with the Contract Documents. Evaluation shall include professional engineer's seal or stamp, registration number, and original signature.
 - 4) When SPCC Plan is required, preparing, supervising the preparation of, or reviewing the SPCC Plan (or designated portions thereof when oil storage at the Site will be 10,000 gallons or less) in accordance with the Contract

- Documents. SPCC Plan (or designated portions thereof) shall include professional engineer's seal or stamp, registration number, and original signature.
- 5) Periodically re-evaluating the need for SPCC Plan and issuing findings as letter-reports with seal or stamp, license number, and signature. When SPCC Plan is required, periodically evaluating the SPCC Plan and providing recommendations for compliance with Laws and Regulations, in accordance with the Contract Documents.
 - 6) Certifying that:
 - a) It is familiar with the Laws and Regulations, including 40 CFR 112,
 - b) It has visited, examined, and is familiar with the Site, planned modifications to the Site under the Project as such modifications pertain to SPCC Laws and Regulations,
 - c) It has performed the evaluations and prepared SPCC Plan in accordance with the Contract Documents,
 - d) Procedures for required testing and inspections have been established,
 - e) The said evaluations and SPCC Plan are adequate for the Project, and
 - f) The said evaluations and SPCC Plan complies with Laws and Regulations, applicable industry standards, and to prevailing standards of practice.

1.5. SUBMITTALS

- A. SPCC Evaluations:
 1. Submit letter presenting results of evaluation of whether a SPCC Plan is required for the Project. Submit evaluation not later than fourteen days after the Contract Times commence running, unless longer time is allowed by PROFESSIONAL.
 2. Submit updated evaluations as required when conditions at the Site change. Submit updated evaluation not later than seven days after the conditions at the Site change, or within seven days of PROFESSIONAL's request, unless longer time is allowed by PROFESSIONAL.
 3. Submit certification signed by preparer of submittal that the submittal complies with the Contract Documents and Laws and Regulations. Signature shall be original.
- B. SPCC Plan: When SPCC Plan is required:
 1. Submit jointly to OWNER and PROFESSIONAL. Submit within 14 days of receipt of PROFESSIONAL's acceptance of evaluation submittal.
 2. Update and resubmit the SPCC Plan, or acceptable SPCC Plan amendments, as required when conditions at the Site change. Submit updated SPCC Plan or amendments not later than seven days after the change in conditions at the Site change giving rise to the SPCC Plan change or amendment, or within seven days of PROFESSIONAL's request, unless longer time is allowed by PROFESSIONAL.
 3. Submit certification signed by preparer of submittal that the submittal complies with the Contract Documents and Laws and Regulations. Signature shall be original.
- C. SPCC Plan Distribution: When SPCC Plan is required, submit copies of letters transmitting SPCC Plan and amendments (if any) to contractors and Subcontractors working at the Site.
- D. Qualifications Statements: CONTRACTOR's professional engineer, when requested by PROFESSIONAL or OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. This Section includes general requirements relative to regulatory requirements of which OWNER and PROFESSIONAL are aware that apply to the Project.
 - 2. CONTRACTOR shall provide labor, materials, equipment, tools, and incidentals shown, specified, and required to obtain required permits and comply with required permits and licenses.
 - 3. CONTRACTOR shall comply with all regulatory requirements whether or not indicated in this Section or elsewhere in the Contract Documents.

1.2. LAWS AND CODES

- A. CONTRACTOR and its Subcontractors/Suppliers must comply with all Federal, State and local Laws applicable to the Work and site.
- B. All Works must be provided in accordance with the State Construction Code Act, 1972 PA 230, as amended, MCL 125.1501 et seq., International Building and Residential Codes and all applicable Michigan construction codes and fire safety including but not limited to: Michigan Building Code, Michigan Residential Code, Michigan Uniform Energy Code, Michigan Electrical Code, Michigan Rehabilitation Code for Existing Buildings, Michigan Mechanical Code, Michigan Elevator Code and Michigan Plumbing Code.
- C. If CONTRACTOR observes that any Contract Document conflicts with any Laws or the State Construction Code or any permits in any respect, CONTRACTOR must promptly notify the PROFESSIONAL in writing. If CONTRACTOR provides any Work knowing or having to reason to know of such conflict, CONTRACTOR must be responsible for that performance.

1.3. PERMITS

- A. All required construction permits must be secured and their fees including inspection costs must be paid by CONTRACTOR.
- B. The time incurred by CONTRACTOR in obtaining construction permits must constitute time required to complete the Work and does not justify any increases to the Contract Time or Price, except when revisions to the Drawings and/or Specifications required by the permitting authority cause the Delays.
- C. CONTRACTOR must pay all charges of Public Utilities for connections to the Work, unless otherwise provided by Cash Allowances specific to those connections.
- D. The following permit fees shall be paid by the CONTRACTOR:
 - 1. "Discharge Permit" - Industrial Discharge Contract from the City of Manistique, Michigan Municipal Corporation obtained by the CONTRACTOR for the pre-treatment and/or treatment system operated by the CONTRACTOR as the permitted discharger in accordance with Section 02 73 00, Wastewater Handling and Disposal.
 - 2. State of Michigan Industrial Stormwater Permit.
 - 3. Soil Erosion and Sedimentation Control Plan Approval.

- E. The following permits will be obtained by the OWNER.
 - 1. MDEQ Joint Permit for Dredging.
 - 2. TSCA, PCB Disposal, 40 Code of Federal Regulations 761
 - 3. Resource Conservation and Recovery Act (40 Code of Federal Regulations 257-258, 260-270)
 - 4. Part 111 - Hazardous Waste Management Permit
 - 5. National Historical Preservation Act
 - 6. Environmental Assessment - FONSI

1.4. TAXES

- A. CONTRACTOR must pay all Michigan sales and use taxes and any other similar taxes covering the Work that are currently imposed by legislative enactment and as administered by the Michigan Department of Treasury, Revenue Division.
- B. If CONTRACTOR is not required to pay or bear the burden or obtains a refund of any taxes deemed to have been included in the Bid and Contract Price, the Contract Price must be reduced by a like amount and that amount, whether as a refund or otherwise, must ensure solely to the benefit of the State of Michigan.

1.5. SAFETY AND PROTECTION

- A. CONTRACTOR and its Subcontractors/Suppliers must comply with all applicable Federal, State and local Laws governing the safety and protection of persons or property, including, but not limited to the Michigan Occupational Safety and Health Act (MIOSHA), 1974 PA 154, as amended, MCL 408.1001 et seq., and all rules promulgated under the Act.
- B. CONTRACTOR is responsible for all damages, injury or loss to the Work, materials, equipment, fines, and penalties as a result of any violation of such Laws, except when it's due to the fault of the Drawings or Specifications or to the Act, error or omission of the OWNER or PROFESSIONAL.
- C. CONTRACTOR is solely responsible for initiating, maintaining and supervising all safety precautions and programs and such responsibility must continue until such time as the PROFESSIONAL is satisfied that the Work, or Work inspected, is completed and ready for final payment.
- D. In doing the Work, CONTRACTOR must take all necessary precautions for the safety of, and must erect and maintain all necessary safeguards and provide the necessary protection to prevent damage, injury or loss to:
 - 1. All employees involved with the Work and other persons who may be affected by the Work,
 - 2. All the Work and materials and equipment to be incorporated into the Work, whether stored on or off the site
 - 3. Other property at or adjacent to the site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Utilities not designated for removal, relocation or replacement.
- E. In the event of severe weather, CONTRACTOR must inspect the Work and the site and take all reasonably necessary actions and precautions to protect the Work and ensure that public access and safety are maintained.

1.6. FIRE HAZARD CONDITIONS:

- A. The fire hazard classification of finish materials where used in the specification must be in accordance with the current Michigan Building Code.
- B. Classification must be determined by tunnel test in accordance with National Fire Protection Association (NFPA-255), American Society for Testing Materials (ASTM E-84) or Underwriters' Laboratories, Inc. (UL-723).

1.7. FLAME/SMOKE RESISTANCE STANDARDS:

- A. CONTRACTOR must provide carpeting (if applicable) complying with "Class B" requirements as set forth in Michigan Department of State Police State Fire Safety Board "Health Care Facilities Fire Safety Rules' R29.1243, Rule 243, when tested in accordance with the following procedures:
 - 1. Tunnel Test: Test for surface burning characteristics, with ratings for flame spread, fuel contribution, and/or smoke density; ASTM E 84, UL 723, or NFPA No. 255.
 - 2. Pill Test: Test for flammability; ASTM D 2859, or DOC FF-1-70.
 - 3. Floor Radiant Panel Test: Test for burning under varying radiant energy levels; ASTM E 648, with minimum average radiant flux ratings not less than 0.45 watts/sq. cm.
 - 4. Smoke Density Test: Test in radiant heat chamber, with and without flame, for density of smoke generated; ASTM E 662, or NFPA No. 258, also known as NBS Smoke Density Chamber Test.

1.8. MICHIGAN RIGHT-TO-KNOW LAW

- A. CONTRACTOR and its Subcontractors/Suppliers must comply with MIOSHA, Michigan Right-to-Know Law (Public Act 80 of 1986) and the rules promulgated under it. The Act places certain requirements on employers to develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers and development and availability of Safety Data Sheets (SDS), and to provide training for employees who work with these chemicals and develop a written hazard communications program. The Act also provides for specific employee rights, including the right to be notified of the location of SDS and to be notified at the site of new or revised SDS within five Business Days after receipt and to request SDS copies from their employers. CONTRACTOR, employer or Subcontractor must post and update these notices at the site.

1.9. ENVIRONMENTAL REQUIREMENTS

- A. CONTRACTOR and its Subcontractors/Suppliers must comply with all applicable Federal, State and local environmental Laws, standards, orders or requirements including but not limited to the National Environmental Policy Act of 1969, as amended, Michigan Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended, the Clean Air Act, as amended, the Clean Water Act, as amended, the Safe Drinking Water Act, as amended, Pollution Prevention Act, as amended, Resource Conservation and Recovery Act, as amended, National Historic Preservation Act, as amended and Energy Policy and Conservation Act and Energy Standards for Buildings Except Low-Rise Residential Buildings, ANSI/ASHRAE/IESNA Standard 90.1-1999.

1.10. NONDISCRIMINATION

- A. For all State Contracts for goods or services in amount of \$5,000 or more, or for Contracts entered into with parties employing three or more employees; in connection with the performance of Work under this Contract, CONTRACTOR and its Subcontractors and Suppliers must comply with the following requirements:

1. Not to discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, sex, height, weight or marital status and take affirmative action to ensure that applicants are employed and the employees are not subject to such discrimination. Such action must include, but is not be limited to, the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training.
2. To state in all solicitations or advertisements for employees that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex, height, weight or marital status.
3. To send, or have its collective bargaining representative send, each labor union or representative of workers with which there is a collective bargaining agreement or other contract or understanding, a notice advising the labor unions or workers' representative of the commitments under this provision.
4. To comply with the Elliot-Larsen Civil Rights Act, 1976 PA 453, as amended, MCL 37.2201 et seq.; the Michigan Persons With Disability Civil Rights Act, 1976 PA 220, as amended, MCL 37.1101 et Seq.; and all published rules, regulations, directives, and orders of the Michigan Civil Rights Commission (MCRC) which may be in effect on or before the date of Bid opening.
5. CONTRACTOR must furnish and file compliance reports within the times, and using the forms prescribed by the MCRC. Compliance report forms may also elicit information as to the practices, policies, programs, and employment statistics of CONTRACTOR and Subcontractors. CONTRACTOR must permit access to Records by the MCRC and its agent for purposes of ascertaining compliance with the Contract and with rules, regulations, and orders of the MCRC.
6. If, after a hearing held under its rules, the MCRC finds that CONTRACTOR has not complied with the nondiscrimination requirements of the Contract Documents, MCRC may, as part of its order, certify its findings to the Administrative Board of the State of Michigan, which may order the cancellation of the Contract and/or declare CONTRACTOR ineligible for future contracts with the State until CONTRACTOR complies with the MCRC's order.

1.11. MICHIGAN RESIDENCY FOR EMPLOYEES

- A. Fifty percent of the persons employed on the Work by CONTRACTOR must have been residents of the State of Michigan for not less than one year before beginning employment on the Work. This residency requirement may be reduced or waived to the extent that Michigan residents are not available or to the extent necessary to comply with the federal funds used for the Project. This requirement does not apply to employers who are signatories to collective bargaining agreements that allow for the portability of employees on an interstate basis.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
1. Section includes the following:
 - a. Definitions and terminology in general use in the Contract Documents.
 - b. Applicable codes.
 - c. Abbreviations in general use throughout the Contract Documents.
 - d. General requirements regarding reference standards, including a listing of standard-issuing organizations (and their acronyms) used in the Contract Documents.

1.2. DEFINITIONS AND TERMINOLOGY

- A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions, as may be modified by the Supplementary Conditions.
- B. Additional terminology used in the Contract Documents includes the following:
1. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs, provisions, tables, or schedules in the Specifications and similar locations in the other Contract Documents. Terminology such as "shown", "noted", "scheduled", and "specified" are used to help the user locate the reference without limitation on the location.
 2. "Installer", "applicator", or "erector" is CONTRACTOR or another person or entity engaged by CONTRACTOR, either as an employee or Subcontractor, to perform a particular construction activity, including installation, erection, application, or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.
 - a. The term "experienced", when used in conjunction with the term "installer", means having successfully completed not less than five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated and required; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed, unless other experience requirements specific to that element of the Work are indicated elsewhere in the Contract Documents.
 3. Trades: Use of terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter", unless otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

1.3. ABBREVIATIONS

- A. Common abbreviations that may be found in the Contract Documents are indicated below, alphabetically by their written-out meaning:

Best Management Practices
Code of Federal Regulations
computer-aided drafting and design
cubic yard

BMP
CFR
CADD, or CAD
cu yd, or CY

dollars	\$
Dredge Management Unit	DMU
feet	ft
foot-pound	ft-lb
Health and Safety Plan	HASP
linear foot	lin ft or LF
linear low-density polyethylene	LLDPE
Michigan Test Methods	MTM
National Geodetic Vertical Datum of 1929	NGVD 29
Nephelometric Turbidity Units	NTUs
North American Datum of 1983	NAD 83
Operable Unit 1	OU1
Operations Monitoring and Maintenance Plan	OM&M Plan
Polychlorinated Biphenyls	PCB
Portable Document Format	PDF
Publicly Owned Treatment Works	POTW
Real-Time Kinematics Differential Global Positioning System	RTK DGPS
Resident Project Representative	RPR
Safety Data Sheet	SDS
Soil Erosion and Sedimentation Control	SESC
Spill Prevention Control and Countermeasures	SPCC
Surface-Weighted Average Concentration	SWAC
Wastewater Treatment Plant	WWTP

1.4. REFERENCE STANDARDS

- A. Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only. The following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

ACGIH	American Conference of Governmental Industrial Hygienists
AISC	American Institute of Steel Construction, Inc.
ANSI	American National Standards Institute, Inc.
APA	Authorized Public Agency
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASTM	American Society of Testing and Materials
DOC	United States Department of Commerce
DOT	United States Department of Transportation
DTMB	Department of Technology, Management and Budget of the State of Michigan
ELAP	Environmental Laboratory Approval Program
FBSA	DTMB Facilities and Business Services Administration
IESNA	Illuminating Engineering Society of North America
MCL	Michigan Compiled Laws
MCRC	Michigan Civil Rights Commission
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MIOSHA	Michigan Occupational Safety and Health Act
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NREPA	Natural Resources and Environmental Protection Act, 1994 PA 451, as amended
OSHA	Occupational Safety and Health Administration
PA	Public Act

RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
UL	Underwriters Laboratories, Inc.
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall employ and pay for services of independent testing laboratory to perform specified services. All tests required by the OWNER must fulfill ASTM, ANSI, Commercial and other Standards for testing.
 - 2. Inspection, sampling, and testing shall be as specified in the Specifications including but not limited to:
 - a. Section 02 61 10, Handling and Disposal of Impacted Material.
 - b. Section 02 73 00, Wastewater Handling and Disposal.
 - c. Section 31 05 15, Fill Materials for Earthwork.
 - d. Section 31 05 19, Geosynthetics for Earthwork.
 - e. Section 31 20 00, Earth Moving.
 - f. Section 32 60 00, Site Restoration.
 - g. Section 35 20 23, Dredging and Cover.
 - h. Other tests indicated in Contract Documents and not specifically assigned to others.
 - 3. CONTRACTOR shall pay for:
 - a. Tests not specifically indicated in the Contract Documents as being OWNER's responsibility.
 - b. Tests made for CONTRACTOR's convenience.
 - c. Repeat tests required because of CONTRACTOR's negligence or defective Work, and retesting after failure of test for same to comply with the Contract Documents.
 - 4. Testing laboratory is not authorized to approve or accept any portion of the Work or defective Work; rescind, alter, or augment requirements of Contract Documents; and perform duties of CONTRACTOR.

1.2. REFERENCES

- A. Standards referenced in this Section are:
 - 1. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- B. Arcadis. Construction Quality Assurance Plan. Manistique Area of Concern, Schoolcraft County, Michigan (To Be Drafted).

1.3. QUALITY ASSURANCE

- A. Testing Laboratory Qualifications:
 - 1. Comply with applicable requirements of ASTM E329.
 - 2. Testing laboratory shall be licensed to operate in the same jurisdiction as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.
 - 3. Testing equipment used by laboratory shall be calibrated at intervals of not more than twelve months by devices of accuracy traceable to one of the following: certified by state or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

1.4. SUBMITTALS

- A. Quality Control Submittals and Test Reports:
 - 1. Testing laboratory shall promptly submit to CONTRACTOR results of testing and inspections, including:
 - a. Date issued.
 - b. Project title, number, and name of the Site.
 - c. Testing laboratory name and address.
 - d. Name and signature of inspector or person obtaining samples.
 - e. Date of inspection or sampling.
 - f. Record of temperature and weather conditions.
 - g. Date of test.
 - h. Identification of material or item tested, and associated Specifications Section.
 - i. Location in the Project.
 - j. Type of inspection or test.
 - k. Results of tests and observations regarding compliance with Contract Documents.
 - 2. CONTRACTOR must submit a minimum of three copies of each test report to the PROFESSIONAL for evaluation and subsequent distribution.
- B. Qualifications Statements:
 - 1. Testing Laboratory:
 - a. Qualifications statement indicating experience and facilities for tests required under the Contract Documents.

1.5. TESTING LABORATORY DUTIES

- A. Testing laboratory shall:
 - 1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.
 - 2. Perform required inspections, sampling, and testing of materials and methods of construction; comply with applicable reference standards and the Contract Documents; and ascertain compliance with requirements of the Contract Documents.
 - 3. Promptly notify PROFESSIONAL and CONTRACTOR of irregularities or deficiencies in the Work that are observed during performance of services.
 - 4. Promptly submit to CONTRACTOR reports of inspections and tests.
 - 5. Perform additional tests and services, as required by CONTRACTOR.

1.6. CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall:
 - 1. Cooperate with testing laboratory personnel.
 - 2. Provide to testing laboratory preliminary representative samples of materials and items to be tested, in required quantities.
 - 3. Promptly submit to PROFESSIONAL results of tests and inspections received.
 - 4. Provide labor and facilities:
 - a. For access to the Work to be tested, and where required, to Suppliers' operations.
 - b. For obtaining and handling samples at the Site.
 - c. For facilitating inspections and tests.
 - d. For testing laboratory's exclusive use for storing and curing of test samples.
 - e. Forms for preparing concrete test beams and cylinders.
 - 5. Notify laboratory and PROFESSIONAL sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
 - 6. Arrange with laboratory and pay for additional services, sampling, and testing required for CONTRACTOR's convenience.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all temporary utilities required for the Project, including the following:
 - a. Electricity.
 - b. Lighting.
 - c. Telephone and communications.
 - d. Water.
 - e. Fire protection.
 2. Make all arrangements with utility owners for temporary utilities and with others as appropriate for temporary facilities. Obtain required permits and approvals for temporary utilities and temporary facilities.
 3. Pay all service costs for utilities and facilities indicated in this Section as CONTRACTOR's responsibility, including cost of electricity, water, fuel, and other utility services and temporary facilities required for the Work unless otherwise specified.
 4. Continuously maintain adequate temporary utilities and temporary facilities for all purposes for the Project, until removal of temporary utilities and temporary facilities. At minimum, provide and maintain temporary utilities and temporary facilities through Substantial Completion and removal of temporary field offices and sheds unless otherwise approved in writing by PROFESSIONAL.
 5. Maintain, including cleaning, temporary utilities and temporary facilities, and continuously provide consumables as required.
 6. Temporary utilities and temporary facilities shall be adequate for personnel using the Site and the needs of the Project.
 7. Provide temporary utilities and temporary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

1.2. REQUIREMENTS FOR TEMPORARY UTILITIES AND TEMPORARY FACILITIES

- A. Electrical:
1. Provide temporary electrical service required for the Work, including continuous power for temporary field offices and sheds. Provide temporary outlets with circuit breaker protection and ground fault protection.
- B. Lighting.
1. Provide and maintain lighting for construction operations. Minimum lighting shall be five foot-candles for open areas.
- C. Telephone and Communications.
1. Provide temporary telephone and communications required for CONTRACTOR's operations at the Site and for summoning emergency medical assistance.
 2. Provide unlimited (untimed) high-speed, wireless Internet access.
- D. Water.
1. Provide water for temporary sanitary facilities, field offices, Site maintenance and cleaning and, when applicable, disinfecting and testing of systems.

2. Continuously maintain adequate water flow and pressure for all purposes during the Project, until removal of temporary water system.

E. Fire Protection.

1. Provide temporary fire protection, including portable fire extinguishers rated not less than 2A or 5B in accordance with NFPA 10, Portable Fire Extinguishers.

1.3. USE OF PERMANENT SYSTEMS

A. Use of Permanent Utility Systems Provided Under the Project:

1. If existing water or electricity service is currently obtained by the OWNER in the area where Work will be performed, CONTRACTOR will not be charged for reasonable use of these services for construction operation. CONTRACTOR must pay costs for installation and removal of any temporary connections including necessary safety devices and controls. Use of services must not disrupt or interfere with operations of the OWNER.

PART 2 PRODUCTS

2.1. MATERIALS AND EQUIPMENT

- A. Materials and equipment for temporary systems may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.
- B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install temporary utilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.
- B. Location of Temporary Utilities:
1. Locate temporary systems for proper function and service.
 2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.
 3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.
- C. Modify and extend temporary systems as required by progress of the Work.

3.2. USE

- A. Maintain temporary systems to provide safe, continuous service as required.
- B. Properly supervise operation of temporary systems:
1. Enforce compliance with Laws and Regulations.
 2. Enforce safe practices.
 3. Prevent abuse of services.
 4. Prevent nuisances and hazards caused by temporary systems and their use.
 5. Prevent damage to finishes.
 6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

- C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the Site. Provide additional consumables if the supply on hand is insufficient.

3.3. REMOVAL

- A. Completely remove temporary utilities, facilities, equipment, and materials when no longer required. Repair damage caused by temporary systems and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.
- B. Where temporary utilities are disconnected from existing utility, provide suitable, watertight or gastight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.
- C. When permanent utilities and systems that were used for temporary utilities, upon Substantial Completion replace all consumables such as filters and light bulbs and parts used during the Work.

END OF SECTION

SECTION 01 52 00

CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide and maintain:
 - a. One field office for use by PROFESSIONAL and Agency. Provide field office at location approved by PROFESSIONAL, near CONTRACTOR's field office(s).
 - b. Field office(s) for CONTRACTOR's use with at least the minimum facilities specified.
 - c. Storage and work sheds.
 - d. Sanitary facilities.
 - e. First-aid facilities.
 - 2. Pay for required permits and utilities. Field offices and sheds shall comply with Laws and Regulations.

PART 2 PRODUCTS

2.1. REQUIREMENTS FOR TEMPORARY CONSTRUCTION FACILITIES

- A. General:
 - 1. Materials and equipment for temporary construction facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.
 - 2. Job signs with CONTRACTOR's name, logos, specialty, etc., are not allowed.
 - 3. Provide required materials, equipment, and facilities, including consumables.
 - 4. Comply with Section 01 51 00, Temporary Utilities.
 - 5. Provide the following for each field office:
 - a. Electrical System and Lighting:
 - 1) Electric service as required, including paying all costs.
 - 2) Interior lighting of 50 foot-candles at desktop height.
 - 3) Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
 - 4) Exterior, wall-mounted lighting at entrance to field office, 250-watt minimum.
 - b. Heating, Ventilating, and Air Conditioning System:
 - 1) Automatic heating to maintain indoor temperature of at least 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
 - 2) Automatic cooling to maintain indoor temperature no warmer than 75 degrees F in warm weather.
 - c. Internet Access: Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access. CONTRACTOR shall provide high-speed, wireless Internet service for laptop computer users and mobile devices.
- B. CONTRACTOR's Field Office and Furnishing:
 - 1. Provide, erect, furnish, and maintain a field office trailer(s) for CONTRACTOR's use.
- C. PROFESSIONAL/Agency Field Office and Furnishings:
 - 1. CONTRACTOR shall erect, furnish, and maintain a field office for use by the PROFESSIONAL and Agency. Sharing of a common facility that provides these minimum requirements for use by PROFESSIONAL and Agency will be acceptable.
 - 2. Construction: PROFESSIONAL/Agency field office shall conform to the following:

- a. Structurally sound foundation and superstructure.
 - b. Size: Minimum floor area of 200 square feet.
 - c. Field Office Ingress and Egress:
 - 1) Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing conforming to building codes in effect at the Site.
 - 2) Landing and stairs shall have slip-resistant walking surfaces, and be metal, pressure-treated wood, fiberglass, or concrete.
 - 3) Railing shall be metal, wood, or fiberglass.
 - 4) Doors shall be secure and lockable, and each furnished with suitable, lockable security bar.
 - d. Windows: Window area equal to at least ten percent of floor area. Windows shall each have insect screen and operable sash. Provide each window with lock and exterior security bars approved by PROFESSIONAL.
 - e. One lockable closet for storage.
 - f. Furnish to PROFESSIONAL and Agency two identical sets of keys suitable for operating keyed locks in the PROFESSIONAL/Agency field office, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.
3. Furniture:
- a. Provide the following furnishings and equipment in each field office:
 - 1) Four flat-top movable desks with lockable filing and storage drawers.
 - 2) Four high backed, cushioned swivel desk chairs.
 - 3) Other Chairs: Four side chairs with arm rests and padded seats and backs, and eight metal folding chairs without arm rests.
 - 4) Three folding tables, each 6 feet long by 2.5 feet wide.
 - 5) Plan rack(s) to hold minimum of two sets of the Drawings.
 - 6) Two 4-drawer legal size, filing cabinets with locks.
 - 7) One 2-door storage cabinet.
 - 8) Shelving or bookcase at least 12 inches deep.
 - 9) Two large waste baskets.
 - 10) Suitable doormat at each exterior ingress/egress door.
 - 11) One white board for use with dry markers. Furnish supply of colored markers and eraser for the white board.
 - 12) Fire extinguishers with associated signage, and smoke detector, in accordance with Laws and Regulations. At minimum, for each field office structure, provide two wall-mounted fire extinguishers and one battery operated ceiling-mounted smoke detector.
 - 13) First-aid kit.
 - 14) One refrigerator (minimum 2.5-cubic-foot capacity).
 - 15) Two electric clocks.
 - 16) One electric coffee maker, with ten-cup capacity or larger.
 - 17) Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
 - 18) Multi-function Copier: One new or used (in good condition) machine capable of photocopying, printing, and scanning to produce PDF and JPG files of sheets up to 11"by 17".
 - 19) Internet Access: Provide internet service until removal of the field office, with unlimited (untimed), high-speed, wireless Internet service for laptop computer users and mobile devices.
- D. Storage and Work Sheds:
- 1. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved in the Work. Contractor shall determine the number of storage and work sheds needed for the project. Sheds and other temporary structures shall be of sturdy construction and neat appearance.

- E. Sanitary Facilities.
 - 1. Provide and maintain suitably-enclosed chemical or self-contained toilets for CONTRACTOR's employees and visitors to the Site as required by the Occupational Safety and Health Administration. Remove and dispose/treat sanitary wastes off-site on a periodic basis, as required and in accordance with applicable laws and regulations. Location of temporary toilets shall be acceptable to OWNER.
 - 2. Provide supply of potable drinking water and related facilities and consumables for all personnel using the Site.
 - 3. Provide suitable temporary washing facilities for employees and visitors.
- F. First-aid Facilities.
 - 1. Provide temporary first-aid stations at or immediately adjacent to the Site's major work areas, and inside CONTRACTOR's temporary field office. Locations of first-aid stations shall be determined by CONTRACTOR's safety representative.
 - 2. Provide list of emergency telephone numbers at each hardwired telephone at the Site.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install construction facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout. Install in accordance with manufacturer's instructions and Laws and Regulations.
- B. Location:
 - 1. Locate field offices, sheds, sanitary facilities, and first-aid facilities in accordance with the Contract Documents and in accordance with the Site mobilization discussions at the preconstruction conference.
- C. Furnish in field office one complete set of the Contract Documents for ready reference by interested parties. In addition to the reference set, comply with Section 01 78 39, Project Record Documents.

3.2. CLEANING, MAINTENANCE, AND SUPPLIES

- A. Provide the following maintenance services:
 - 1. Immediately repair malfunctioning, damaged, leaking, or defective field office structure, site improvements, systems, and equipment.
 - 2. Provide all supplies and pay for maintenance on copiers.
 - 3. Promptly provide snow removal for field offices, including parking area, walkways, and stairs and landings.
 - 4. Provide continuous maintenance and janitorial service of field offices and sanitary facilities. Clean field offices at least once per week
 - 5. Properly dispose of trash as needed, at least twice per week. Dispose of other waste, if any, as required, to avoid creation of nuisances.
- B. Provide the following consumables as needed:
 - 1. Toner or ink cartridges for printer, copier, and fax machine, as required.
 - 2. Paper supplies for copier, fax machine, and printer.
 - 3. Dry markers in six colors and white board eraser set.
 - 4. Bottled water suitable for water dispenser and disposable cups.
 - 5. Coffee supplies, including cups, filters, coffee, sugar, creamer, and stir-sticks.
 - 6. Soap, paper towels, cleansers, sanitary supplies, and janitorial implements, including broom.

7. Batteries for smoke detector and other battery-powered items furnished by CONTRACTOR.
8. Replace fire extinguishers upon expiration.
9. Replenish contents of first-aid kit as required.

3.3. REMOVAL

- A. Do not remove field offices and sheds until after Substantial Completion of the entire Work, unless otherwise approved by OWNER/PROFESSIONAL.
- B. Remove field offices and sheds and restore areas prior to final inspection.

END OF SECTION

SECTION 01 55 13

ACCESS ROADS AND SUPPORT AREAS

PART 1 GENERAL

1.1. DESCRIPTION

A. Scope:

1. The work specified in this Section is to furnish and/or provide all labor, equipment, materials, tools, and services, and complete all work, installed, tested, and ready for use as described in the Design Report (Arcadis 2016).
2. The work described in this Section includes provisions for temporary access roads, walks, parking areas, and appurtenances required during the Project for use by CONTRACTOR, other contractors employed on the Project, OWNER, PROFESSIONAL, facility managers, and emergency vehicles.
3. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR and shall be fully passable to vehicles in all weather conditions.
4. CONTRACTOR shall construct, monitor, and maintain the following temporary support areas as shown on the Drawings and described in this Section:
 - a. Access Roads.
 - b. Parking Areas.
 - c. Staging areas.
 - d. Sediment offloading area
 - e. Sediment dewatering area.
 - f. Containment area for the onsite pre-treatment system.
 - g. Decontamination area.
5. CONTRACTOR shall perform pre-construction and post-removal sampling of the sediment dewatering area as required in this Section.

B. Related Sections:

1. Section 01 33 00, Submittal Procedures.
2. Section 01 35 29, CONTRACTOR'S Health and Safety Plan.
3. Section 01 41 00, Regulatory Requirements.
4. Section 01 57 00, Temporary Controls.
5. Section 01 77 00, Closeout Procedures.
6. Section 02 61 10, Material Handling and Disposal.
7. Section 02 73 00, Wastewater Treatment and Handling.
8. Section 31 05 15, Fill Materials for Earthwork.
9. Section 31 05 19, Geosynthetics for Earthwork.
10. Section 31 20 00, Earth Moving.
11. Section 31 25 00, Soil Erosion and Sedimentation Control.
12. Section 32 60 00, Site Restoration.

1.2. REFERENCES

- A. Arcadis. 2016. Operable Unit 1: Final Design Report. Manistique Area of Concern, Schoolcraft County, Michigan. April.

1.3. SUBMITTALS

- A. Prepare and submit a Support Area Layout to the PROFESSIONAL for review within 15 days of Notice to Proceed. This layout shall be updated and re-submitted to the PROFESSIONAL

for review prior to a new phase of work and mobilization. At a minimum, the Support Area Layout shall include a plan view and construction details that show the following:

1. Locations of temporary access roads, parking areas, and support areas required during the construction activities.
2. Technical specifications and details related to the construction of temporary access roads and parking areas.
3. Technical specifications and details related to the construction of a sediment offloading area.
4. Technical details for staging areas required to store onsite equipment, clean material storage (e.g., gravel, cover material, geotextile, etc.), and other construction supplies.
5. Technical specifications and details for construction of the dewatering area consisting of lined, dewatering pads for sediment and the stockpiling area for contaminated waste material (e.g., dredged sediment and debris generated during construction and dewatered sediment).
6. Technical specifications and details for the construction of a containment area containing temporary facilities associated with the onsite pre-treatment system.
7. Technical specifications and details for the construction of the onsite decontamination area to decontaminate all reusable equipment and materials, and field personnel, as required.
8. Location, layout and operation of temporary stormwater management controls around the above temporary facilities.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Fill materials required to accomplish or be incorporated into the work of this Section shall meet the requirements of Section 31 05 15, Fill Materials for Earthwork.
- B. Geosynthetic materials required to accomplish or be incorporated into the work of this Section shall meet the requirements of Section 31 05 19, Geosynthetics for Earthwork.

PART 3 EXECUTION

3.1. GENERAL

- A. CONTRACTOR shall perform all earth disturbing activities associated with installation of access roads and support areas in accordance with Section 31 20 00, Earth Moving.
- B. CONTRACTOR shall install all temporary controls required prior to earth disturbing activities in accordance with Section 31 25 00, Soil Erosion and Sedimentation Control, and Section 01 57 00, Temporary Controls.

3.2. ACCESS ROADS AND PARKING AREAS

- A. CONTRACTOR shall construct the temporary access roads, as shown on the Drawings, to provide access to the work areas throughout the duration of the project.
- B. Maintain access roads and provide snow removal, as required, during applicable periods of work.
- C. Provide and maintain adequately controlled access to the work area and to all designated zones of the work.

- D. Any damage or deterioration of roads due to use by CONTRACTOR'S equipment in executing the Contract shall be repaired or replaced to pre-existing conditions at no additional cost to the OWNER.
- E. Construction personnel shall park personally owned vehicles in a designated parking area prepared by placing a 6-inch thick layer of gravel underlain by woven geotextile over the uniformly leveled surface. CONTRACTOR shall maintain the designated construction personnel parking areas, as required.
- F. All construction equipment will be parked in a parking area separate from the personal vehicular parking area. CONTRACTOR may alter the location of equipment parking area as the construction progresses to different areas of the Site. Any change in the parking areas shall be reviewed by the PROFESSIONAL prior to implementation. Areas for pedestrian traffic shall be clearly defined.

3.3. LOCATION OF SUPPORT AREAS

- A. Location of all temporary support areas shall be subject to review by the PROFESSIONAL.
- B. Locations where impacted material are handled shall be sampled prior to construction of support areas in accordance with Part 3.10 of this Section.
- C. CONTRACTOR'S operations and location of temporary support areas shall not interfere with other construction activities within the work area.

3.4. CLEAN MATERIAL STAGING AREAS

- A. Construct and maintain a staging area which shall be used for stockpiling of clean borrow material including, but not limited to, gravel, Cover Fill, geotextile, geomembrane, clean equipment. Clean materials will be stored in separate stockpiles according to the material type and/or source.
- B. CONTRACTOR shall be responsible for controlling vehicular traffic in the clean material staging area to prevent migration of contaminants to clean media.
- C. CONTRACTOR shall keep the staging area clear of trash and debris and in neat order. CONTRACTOR shall be responsible for cleanliness and order of assigned staging areas.
- D. Material stockpiles shall be covered with plastic sheeting such that material is protected from precipitation, to prevent cross-contamination, and to mitigate fugitive dust generation.

3.5. SEDIMENT OFFLOADING AREA

- A. Construct and maintain a sediment offloading area necessary to transfer sediment, debris, and decant water safely to the appropriate upland sediment dewatering area. The sediment offloading area may include, but shall not be limited to, barges, modular flexible floating decks, articulated arm excavators, mooring structures, decant pump, piping, pipe connections, valves, spill guards, and barge fenders.
- B. Floating decks, piping, and barges shall be secured properly using methods approved by the PROFESSIONAL.
- C. CONTRACTOR shall select equipment necessary to transfer dredged material (sediment, debris, decant water) from water-based activities to upland. Transfer equipment shall be able to maintain offloading production rates equal to or greater than dredging production rates.

- D. Engineering controls, such as aprons or similar, shall be installed underneath the path of the transfer equipment used during sediment or debris offloading activities to mitigate spills. CONTRACTOR shall line and berm areas beneath engineering controls where sediment may spill or drip during unloading, to minimize spillage of dredged sediment. Spilled dredge material shall be promptly recovered by the CONTRACTOR
- E. CONTRACTOR shall install sediment offloading area to minimize disturbance to the existing bank. Any disturbance to the existing bank shall be restored by the CONTRACTOR at no additional cost to the OWNER to pre-construction conditions, unless otherwise agreed to by the property owner, OWNER, and PROFESSIONAL.

3.6. SEDIMENT DEWATERING AREA

- A. Construct and maintain a sediment dewatering area which shall be large enough for handling, dewatering, and staging the dredged sediment and other construction-related debris/waste material, in accordance with Section 02 61 10, Material Handling and Disposal.
- B. If TSCA and non-TSCA materials are managed at the same time, CONTRACTOR shall install interior barriers (e.g., Jersey barriers), approved by the PROFESSIONAL, as necessary, to segregate non-TSCA and TSCA sediment processing areas.
- C. Areas used to manage TSCA materials shall be appropriately decontaminated prior to being used for managing non-TSCA material.
- D. The components of the dewatering area (i.e., dewatering pads and stockpiling areas) shall be constructed as shown on the Drawings.

3.7. ONSITE PRE-TREATMENT SYSTEM CONTAINMENT AREA

- A. A containment area for the onsite pre-treatment system shall be constructed in accordance with Section 02 73 00, Wastewater Handling and Disposal.

3.8. DECONTAMINATION AREA

- A. Construct the decontamination area by installing a self-contained steel decontamination pad over wooden beams. Size of the decontamination pad shall be sufficient to decontaminate reusable equipment, material, and vehicles.
- B. Install a tire wash station within the decontamination area to remove mud/debris from the equipment and/or vehicle tires.
- C. The decontamination area shall include personnel decontamination stations including hand wash and boot wash stations for decontamination of field personnel.

3.9. REMOVAL OF SUPPORT AREAS AND ACCESS ROADS

- A. At the completion of the work, temporary support areas and associated materials shall be removed as directed by the PROFESSIONAL and in accordance with Section 01 77 00, Closeout Procedures.
- B. Materials used to construct support areas and access roads shall be removed and properly disposed off-site at a licensed disposal facility approved by the OWNER.
 - 1. Material used in support areas for TSCA material handling shall be disposed as TSCA material.

2. CONTRACTOR shall perform "Offsite Transport" and "Disposal" in accordance with the applicable articles in Part 3 of Section 02 61 10, Handling and Disposal of Impacted Materials.
- C. Following removal of support areas, perform sampling in accordance with Part 3.10 of this Section.
- D. The disturbed surfaces of the support areas shall be restored in accordance with the Section 32 60 00, Site Restoration.
- E. Some access roads may be left in place for post-construction monitoring and maintenance, if approved by the PROFESSIONAL.

3.10. FIELD QUALITY CONTROLS

- A. Support Area Soil Sampling
 1. General:
 - a. Soils samples from the upper 6-inches of soil shall be collected by CONTRACTOR and submitted to an approved laboratory for the following minimum testing (or as modified by property access agreements):
 - 1) PCBs
 - 2) Semi-volatile Organic Compounds
 - 3) Volatile Organic Compounds
 - 4) Target Analyte List Metals
 - 5) Mercury
 - 6) Pesticides
 - 7) Dioxins/Furans
 2. Pre-Construction Sampling:
 - a. Collect samples at the following frequency:
 - 1) Sediment Dewatering Area: Minimum 1 sample per area or 1 sample per 5,000 square feet, whichever is greater.
 - 2) Decontamination Area: Minimum 2 samples per area.
 3. Post-Construction Sampling:
 - a. Collect samples at the following frequency by area:
 - 1) Sediment Dewatering Area: Collect samples at the minimum following locations:
 - a) 1 sample below each tear identified in the liner material.
 - b) Minimum 1 sample per area or 1 sample per 5,000 square feet, whichever is greater.
 - 2) Decontamination Area: Collect samples at the minimum following locations:
 - a) 1 sample below each tear identified in the liner material.
 - b) Minimum 2 samples per area.

END OF SECTION

SECTION 01 56 00

TEMPORARY BARRIERS AND ENCLOSURES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall safely guard all the Work, the Project, products, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion. CONTRACTOR's duty includes safely guarding OWNER's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.
 - a. Costs for security required under this Section shall be paid by CONTRACTOR.
 - b. Make no claim against OWNER for damage resulting from trespass.
 - c. Pay full compensation for, or repair or replace, damage to property of OWNER and others arising from failure to furnish adequate security.
 - 2. CONTRACTOR must furnish, install and maintain as long as necessary and remove when no longer required adequate barriers, warning signs, or lights at all dangerous points throughout the Work for protection of property, workers and the public.

1.2. REQUIREMENTS FOR TEMPORARY BARRIERS AND ENCLOSURES

- A. Temporary Fence:
 - 1. CONTRACTOR must entirely enclose the upland support area(s) by means of woven wire fence having minimum height of 6 feet.
 - 2. CONTRACTOR shall restrict access along shoreline as required to perform the Work and protect public.
 - 3. Gates must be provided at all points of access. Gates must be closed and secured in place at all times when Work under the Contract is not in progress.
 - 4. Fence shall be removed and restored to original condition upon completion of the Work.
- B. Temporary Barrier:
 - 1. Temporary barrier shall be high visibility, snow fence-type fencing, 4 feet high.
 - 2. Posts:
 - a. Posts shall be steel, either "U"-, "Y"-, "T"-shaped, or channel section.
 - b. Posts shall have a nominal weight of not less than 1/3-pound per linear foot, exclusive of the anchor.
 - c. Posts shall have tapered anchors weighing not less than 0.67 pounds, each firmly attached by means of welding, riveting, or clamping.
 - d. Posts shall have corrugations, knobs, notches, or studs placed and constructed to engage a substantial number of fenceline wire in the proper position.
 - e. Provide each post with sufficient quantity of galvanized wire fasteners, clamps, or zip ties, of not less than 0.120-inch diameter, for attaching fence to post.
- C. Street Barricades:
 - 1. CONTRACTOR must erect and maintain all street barricades, signal lights and lane change markers during the periods that a traffic lane is closed for their operations. There must be full compliance with rules and ordinances respecting such street barricading and devices must be removed when hazard is no longer present.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide and maintain methods, materials, equipment, and temporary construction as required for controlling environmental conditions at the Site and adjacent areas during construction.
 - 2. Maintain temporary controls until no longer required. Provide temporary controls at all times when CONTRACTOR is working at the Site.
 - 3. Temporary controls include, but are not limited to, the following:
 - a. Turbidity and water quality controls.
 - b. Odor, vapor, and dust controls.
 - c. Noise controls.
 - d. Pollution controls.
 - e. Pest and rodent controls.
 - f. Traffic controls.
 - g. Water diversion controls (if used).
- B. Related Sections:
 - 1. Section 01 11 00, Summary of Work.
 - 2. Section 01 35 29, CONTRACTOR's Health and Safety Plan.
 - 3. Section 31 25 00, Soil Erosion and Sedimentation Controls.

1.2. TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
 - 1. Operations Monitoring and Maintenance Plan (OM&M Plan): The OM&M Plan will be prepared by the PROFESSIONAL as part of the pre-mobilization activities. The OM&M Plan will describe monitoring and maintenance that will be conducted during remedial activities by the PROFESSIONAL.

1.3. QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:
 - 1. Michigan Department of Environmental Quality (MDEQ) Nonpoint Source Best Management Practices Manual.

1.4. SUBMITTALS

- A. Procedural Submittals: Submit the following plans (separate or as part of CONTRACTOR's Operations Plan [required by Section 01 11 00, Summary of Work]):
 - 1. Turbidity and Sheen Control Plan, which shall include at a minimum:
 - a. Description of the proposed rigid barrier (as appropriate) and turbidity curtain alignment, turbidity curtain anchoring system, and attachment points for the ends of the curtain.
 - b. Plans and elevation views locating and defining intended placement of all materials to be installed. All structures and pertinent items shall be shown and dimensioned,

- including details of the rigid barrier and turbidity curtain attachment points and anchoring systems. Associated drawings must be stamped by a Michigan State-licensed Professional Engineer.
- c. Data and information used in the design analysis.
- d. Manufacturer's data that indicates the material properties of the rigid barrier system components and turbidity curtain.
- e. Safety lighting and signage plan for the rigid barrier system and turbidity curtain system to be installed outside the boundary of the dredge area.
- 2. Odor, Dust, and Vapor Control Plan.
- 3. Noise Control Plan.
- 4. Pollution Control Plan.
- 5. Traffic Control Plan.
 - a. Submit a Traffic Control Plan to the PROFESSIONAL for review and approval showing proposed onsite and offsite routes for waste transport. This plan shall be prepared in accordance with the local, state, and federal regulations that pertain to transportation and traffic control.
- 6. Water Diversion Control Plan.
 - a. If CONTRACTOR elects to perform material removal in the dry, CONTRACTOR shall design a water diversion system and controls to divert water from work area and manage water infiltration. CONTRACTOR shall submit Water Diversion Control Plan for review to the PROFESSIONAL.
- B. Product Data: Submit manufacturer's product data, specifications, and installation instructions for the following:
 - 1. Vapor/odor mitigation agents and proposed application and storage equipment for each.
 - 2. Turbidity curtain system materials.
 - 3. Oil absorbent booms.
- C. Shop Drawings:
 - 1. Location of the turbidity curtain system, including details of the "gate" and anchoring system.

PART 2 PRODUCTS

2.1. TURBIDITY AND SHEEN CONTROLS

- A. Turbidity Control System:
 - 1. Turbidity curtain system(s) shall isolate the active Work Area from Manistique River, and minimize the potential for migration of suspended sediments outside the Work Area. Turbidity curtain system(s) may include mobile (e.g., attached to a mobile unit [moon pool dredging]) and stationary systems.
 - 2. CONTRACTOR shall design the turbidity curtain system and any associated anchoring, to withstand expected forces (e.g., river flows, currents, vessel wakes, propeller wash) for the duration of the project.
 - 3. Stationary turbidity curtain system(s) shall include a "gate" to allow passage of project vessels into and out of the Work Area.
 - 4. Turbidity curtains shall be a pre-assembled system, including floatation mechanisms (or other approved installation techniques), permeable geomembrane, bottom weights, securing/tie-off mechanism, and joining mechanism.
 - 5. Turbidity curtain anchoring system shall properly secure the curtain system within the river channel and allow for the curtain to move vertically with any change in water levels.
 - a. Anchoring system for the turbidity curtain may include installation of permanent anchors on shore; however, under no circumstances are turbidity curtains to be anchored to shore without approval from the affected property owner.

6. CONTRACTOR shall install lighting and signage in compliance with all applicable United States Coast Guard (USCG) standards and requirements. Lighting and signage shall include at a minimum:
 - a. Lighted buoys placed upstream, downstream, and out from the turbidity control system at sufficient spacing to adequately signal recreational boaters and other vessels as to the presence of the wall and turbidity curtain.
 - b. Signs indicating "Slow - No Wake" and "Work Area - Stay Back" or other appropriate messages approved by OWNER shall also be installed at the downstream and upstream end, and midway along the turbidity curtain perimeter.

B. Oil Absorbent Boom and Pads:

1. Oil absorbent booms shall be anchored/secured in place inside of the Work Area and installed such that there are no gaps to allow the potential migration of oils/sheens beyond the boom. Additionally, absorbent booms shall also be used around work vessels transferring sediment and/or debris outside the Work Area.
2. Oil absorbent booms shall be five to eight inches in diameter.
3. CONTRACTOR shall maintain and replace oil absorbent booms as necessary to prevent migration of oils/sheens beyond the boom.
4. CONTRACTOR shall also maintain a supply of oil absorbent booms and/or pads to address sheens observed outside the Turbidity Control System

2.2. ODOR, VAPOR, AND DUST CONTROLS

A. Vapor Mitigation Agents: Provide the following:

1. Short-Duration Mitigation Agent:
 - a. BioSolve® Pinkwater®, by The BioSolve Company.
 - b. Or equal.
2. Long-Duration Mitigation Agent:
 - a. AC-645 Long-Duration Foam, by Rusmar, Inc.
 - b. Or equal.

B. Water: Clean, potable.

C. Provide pressure washers, pneumatic foam unit, portable tanks, hoses, and other equipment required for the mixing, storage, and application of vapor mitigation agents and water.

2.3. POLLUTION CONTROLS

- A. Provide spill kits and oil-absorbent pads, rolls, and booms (and john boat for measure deployment) as required to contain spills, should they occur, and prevent the potential migration of pollutants in accordance with all applicable Laws and Regulations. Spill kits shall be located within active remediation areas and dispersed around the site near equipment and petroleum storage areas.

2.4. WATER DIVERSION CONTROLS

- A. CONTRACTOR shall be responsible for the design of the water diversion controls and infiltration water management systems if CONTRACTOR elects to perform material removal in the dry. The CONTRACTOR's water diversion control and infiltration water management systems shall be capable of maintaining the work area completely in the dry, remove accumulated water as quickly as it enters the work area, and manage water in accordance with the Contract Documents. Throughout the duration of the Project, CONTRACTOR shall be responsible for providing additional equipment, products, and materials or their replacements, as necessary, to operate and maintain the onsite pre-treatment system.

PART 3 EXECUTION

3.1. TURBIDITY AND SHEEN CONTROL

A. Installation and Maintenance

1. General:

- a. Provide turbidity and sheen controls as shown and indicated on the Drawings and elsewhere in the Contract Documents. Provide turbidity and sheen controls as the Work progresses into previously undisturbed areas.
 - b. Install turbidity curtain system to isolate the Work Area from surrounding waters. Stationary turbidity curtains system(s) shall include a "gate" area to allow passage of project vessels into and out of the Work Area. CONTRACTOR shall install the turbidity curtain system in a manner that minimizes number of fish within the active work area.
 - c. Use best management practices (BMP) to control turbidity and sheen, including mechanical controls.
 - d. Absorbent booms shall be installed as a component of the turbidity control system(s).
2. Before commencing activities that will disturb sediment at the Work Area, provide all turbidity and sheen control measures required by the Contract Documents for the areas where material will be disturbed.
- a. Removal activities in TSCA removal areas shall be performed with mobile turbidity controls. In these TSCA removal areas, the turbidity controls shall be maintained closely around the perimeter of the specific removal area to limit the potential for the transport of suspended materials. As work is completed in any one TSCA removal area, suspended materials shall be allowed to resettle prior to removing turbidity controls.
 - b. Install turbidity controls to protect culverts and or drainage ditches adjacent to the work area.
3. Implement construction procedures associated with, or that may affect, turbidity and sheen control to ensure minimum damage to the environment during construction. CONTRACTOR shall implement any and all additional measures required to comply with Laws and Regulations.
4. Control turbidity and sheen to minimize transport of material to or from the Site and adjacent surface waters. Such measures shall include, but are not limited to, use of turbidity curtains. Apply such temporary measures to areas disturbed by activities associated with the construction of the Project.

B. Turbidity Monitoring:

1. Turbidity monitoring will be performed by the PROFESSIONAL in accordance with the OM&M Plan to monitor the effectiveness of the turbidity barriers. Monitoring will be conducted by the PROFESSIONAL prior to the start of dredging activities to establish a baseline and subsequently during the dredging operations to assess the effectiveness of the turbidity barriers.
2. During the intrusive operations, turbidity will be monitored by the PROFESSIONAL twice a day at an upstream and downstream location to be determined based on water conditions, active work being performed, and health and safety consideration. If suspended sediment particles (turbidity) caused by work activities is observed outside of the active work area, then turbidity monitoring will be conducted at that location (as well as at an upstream location). Turbidity levels will be measured with a handheld device in nephelometric turbidity units (NTUs).
3. If turbidity action levels, as defined in Table 01 57 00-A, are exceeded the PROFESSIONAL will notify the CONTRACTOR. CONTRACTOR shall work with the PROFESSIONAL to initiate responses to the action level exceedance, up to and including stopping work. CONTRACTOR shall address issues identified in turbidity controls and/or operations in a timely manner and at no additional cost to the OWNER.

TABLE 01 57 00-A
TURBIDITY ACTION LEVELS AND REQUIRED RESPONSE

Turbidity Action Level	Turbidity Results	Response
Normal	$\Delta_T \leq 25$ NTU	Normal Operations
Early Warning I	$\Delta_T > 25$ NTU and $\Delta_T < 50$ NTU	Visual inspection of current work activities and engineering controls
Early Warning II	$\Delta_T \geq 50$ NTU and $T_D < 1.5T_U$	Resample and confirm results; visual inspection of current work activities and engineering controls
Corrective Action	$\Delta_T \geq 50$ NTU and $T_D \geq 1.5T_U$	Resample and confirm results; temporarily cease sediment work until turbidity level is less than 50 NTU or $1.5 T_U$ (whichever is greater) and investigate evaluate probable cause. CONTRACTOR shall perform maintenance/repairs, implement BMPs and/or operational changes, as appropriate, to mitigate cause of exceedance.
Notes: T_D = Downstream turbidity. T_U = Upstream turbidity. Δ_T = Difference in turbidity = $T_D - T_U$		

C. Sheen Controls:

1. Maintain absorbent booms as part of the turbidity curtain system as shown on the Drawings to prevent migration of oils/sheens beyond the dredge area.
2. Implement measures to reduce generation of sheens.
3. Provide equipment and personnel to contain sheens that occur outside of the dredge area, adjacent to equipment/vessels staged outside the dredge area, and/or near the gate in the turbidity curtain prior to opening the gate (e.g., via use of oil absorbent booms/pads). Containerize and properly dispose of used absorbent materials.

D. Inspection and Maintenance:

1. Periodically inspect areas where sediments are disturbed to detect evidence of the start of turbidity and sheen; apply corrective measures as required to control turbidity and sheen.
2. Repair or replace damaged turbidity and sheen controls within 1 hour of CONTRACTOR becoming aware of such damage.

E. Duration of Turbidity and Sheen Controls: Maintain turbidity and sheen controls in effective working condition until the associated Work Area has been returned to pre-construction conditions.

F. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Work Area and adjacent areas while the Work is stopped or suspended.

G. Failure to Provide Adequate Controls: In the event CONTRACTOR repeatedly fails to satisfactorily control turbidity and sheen, Work shall be halted until such corrective actions are taken/employed by CONTRACTOR, to the satisfaction of the OWNER, at no additional cost to the OWNER. Additionally, the OWNER reserves the right to employ outside assistance or to use OWNER's own forces for turbidity and sheen control. Cost of such work, plus engineering and inspection costs, will be deducted from monies due CONTRACTOR.

3.2. NOISE CONTROL

- A. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.
- B. Noise levels associated with normal construction activities shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
 - 1. Noise emissions shall not interfere with the work of OWNER or others.
 - 2. CONTRACTOR's working hours shall conform to normal business hours as defined in the Contract Documents.

3.3. ODOR, VAPOR, AND DUST CONTROL

- A. General:
 - 1. Provide means, methods, and facilities required to control odors, vapors, and dust generated by the Work.
 - 2. Proactively employ odor, vapor, and dust controls during the Work, and evaluate and modify construction techniques and site management practices, as necessary and appropriate, to control objectionable odor, vapor, or dust caused by CONTRACTOR's operation of vehicles and equipment, and other actions.
 - 3. If CONTRACTOR's means, methods, and facilities are unsuccessful in controlling Work-related odors, vapors, and dust as specified in this Section, based on visual observations or the results of air monitoring, Work shall be suspended until appropriate corrective actions are taken by CONTRACTOR to remedy the situation to PROFESSIONAL's satisfaction. OWNER will not be liable for any expense or delay resulting from CONTRACTOR's failure to control odors, vapors, and dust in accordance with this Section.
- B. Vapor Mitigation Agents:
 - 1. Mobilize vapor mitigation agents and means of storage and dispersion at the Work Area before initiating any ground-intrusive Work or dust-generating Work.
 - 2. Application of vapor mitigation agents shall be as follows:
 - a. BioSolve Pinkwater:
 - 1) Prepare three-percent solution of BioSolve® Pinkwater® concentrate and water. Apply to exposed sediments (e.g., on barges) using backpack sprayers, power washers, or misters.
 - 2) When odors encountered, apply when actively excavating, when actively handling dredged materials, and as required by OWNER or PROFESSIONAL.
 - b. AC-645 Long-Duration Foam:
 - 1) Prepare 13-percent solution of AC-645 Long-Duration Foam concentrate and water. Apply to excavation faces and uncovered stockpiles of dredged materials using pneumatic foam unit. Completely and uniformly cover exposed sediment surfaces with minimum three inches of foam.
 - 2) When odors encountered, apply before each work break, at the end of each work day, and as required by OWNER or PROFESSIONAL.
- C. Construction Techniques and Site Management Practices:
 - 1. Remove, place, load, handle, and unload dredged materials and clean backfill materials, in manner that minimizes the generation of dust.
 - 2. To minimize airborne dust, apply water or use other methods subject to acceptance of PROFESSIONAL and approval of authorities having jurisdiction.
 - 3. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on- and off-Site damage, nuisances, and health hazards associated with dust emissions. Control may be achieved by irrigation in which the Site shall be sprinkled with water until the surface is moist. Apply dust controls as frequently

as required without creating nuisances such as excessive mud and ponding of water at the Site.

4. Cover stockpiles of clean backfill materials with polyethylene liners before extended work breaks and at the end of each work day. Anchor liners to resist wind forces; slope to prevent accumulation of water.
5. CONTRACTOR shall remove dust from roadways and access roads on a daily basis by mechanical brooming or other method acceptable to PROFESSIONAL.

3.4. POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.
2. Equipment used during construction shall comply with Laws and Regulations.
3. Hazardous Materials brought to the Site by CONTRACTOR shall be identified in CONTRACTOR's Health and Safety Plan in accordance with Section 01 35 29.
4. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids caused by CONTRACTOR's operations.

B. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.

C. Atmospheric Pollutants:

1. Provide systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

D. Solid Waste:

1. Provide systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose solid waste.
4. Perform Regular Cleaning:
 - a. CONTRACTOR must remove all scrap or removed material, debris or rubbish from the Project work site at the end of each working day and more frequently whenever the OWNER Field Representative deems such material to be a hazard.
 - b. CONTRACTOR cannot discard materials on the grounds of the OWNER without the express permission of the Project Director.
 - c. No salvage or surplus material may be sold on the premises of the OWNER.
 - d. No burning of debris or rubbish is allowed.
 - e. Any recycled materials must be recycled and CONTRACTOR will be required to provide recycling plan.

3.5. TRAFFIC CONTROLS

- A. CONTRACTOR shall maintain the roadways in a passable condition until the work is completed and shall be responsible for any necessary signage and traffic maintenance provisions in accordance with the local and Michigan Department of Transportation (MDOT) regulations.

- B. Keep all streets and traffic ways open for passage of traffic and pedestrians during the Project, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable. Construction traffic shall access the Site only via entrance(s) indicated on the drawings.
- C. CONTRACTOR shall not close or block traffic on any road or highway at any time.
- D. Give required advance notice to fire department, police department, and other emergency services as applicable of proposed construction operations.
- E. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than 7 days prior to construction that will affect the property.
- F. Hydrants, valves, fire alarm boxes, postal boxes and delivery service boxes, and other facilities that may require access during construction shall be kept accessible for use.
- G. Provide temporary signage, signals, barricades, flares, lights and other equipment, service, and personnel required to regulate and protect traffic and warn of hazards. Such Work shall comply with requirements of owner of right-of-way and authorities having jurisdiction at the Site. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.

3.6. WATER DIVERSION CONTROLS

- A. If CONTRACTOR elects to perform material removal in the dry, CONTRACTOR shall install and maintain the water diversion control and infiltration water management systems in accordance with the PROFESSIONAL reviewed Water Diversion Control Plan.
- B. CONTRACTOR shall install turbidity and sheen controls prior to installation of water diversion controls to control potential turbidity and sheen during water diversion system installation. CONTRACTOR shall also maintain turbidity and sheen controls as necessary during operation of water diversion system to protect surface water quality as required by the Contract Documents.

3.7. PROHIBITED CONSTRUCTION PROCEDURES

- A. Prohibited construction procedures include, but are not limited to, the following:
 - 1. Dumping or disposing of spoil material, cleared vegetation, debris, or other waste material in any surface waters, drainage ways, or other unauthorized locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in any surface waters, drainage ways, or other unauthorized locations.

3.8. REMOVAL OF TEMPORARY CONTROLS

- A. Remove temporary controls only when directed by OWNER or PROFESSIONAL.

END OF SECTION

SECTION 01 58 00

PROJECT IDENTIFICATION

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall furnish all labor, materials, tools and equipment, and perform all operations necessary for the construction and maintenance of temporary project signage as specified herein.
 - 2. Do not display any other temporary signs, other than those specified, without prior approval of OWNER.

1.2. SUBMITTALS

- A. Shop Drawing:
 - 1. Shop drawings identifying the dimensions, materials of construction, text, fonts, colors, and graphics/logos (if any) for temporary signs, and the proposed locations and orientations of temporary signs at the Site.
- B. Initial Weekly Report:
 - 1. Provide a photograph of the installed sign in the initial weekly report.

PART 2 PRODUCTS

2.1. MATERIALS AND CONSTRUCTION

- A. Project Identification Sign:
 - 1. Project identification signs, including dimensions, materials of construction, fonts, logos, and colors, shall be as specified in the State of Michigan Department of Technology, Management and Budget (DTMB) guidance document included with this Section.
 - 2. Location: Determine location in consultation with the OWNER and PROFESSIONAL.
 - 3. Printing: Digital or screen printing with ultraviolet-resistant inks.
 - 4. Supports and Bracing: Provide supports and bracing as required to adequately support and brace signs for the duration of the Project.
 - 5. Obtain OWNER and PROFESSIONAL approval before releasing for manufacture.

PART 3 EXECUTION

3.1. GENERAL

- A. Project sign shall be posted in a prominent location at the site following the notice to proceed and shall be maintained throughout the course of the project.
- B. Temporary signs shall be installed within 14 calendar days of the PROFESSIONAL's approval of the shop drawings submittal required by this Section.
- C. Maintain temporary signs until Substantial Completion, or as otherwise directed by the OWNER/ PROFESSIONAL.
- D. Advertisement and names of contractors or consultants are not allowed.

3.2. INSTALLATION AND MAINTENANCE

- A. Obtain OWNER and PROFESSIONAL approval of installation locations before installing temporary signs.
- B. Install temporary signs in accordance with this Section and the manufacturer's instructions.
- C. Temporary signs shall be adequately supported and braced, and properly positioned and aligned.
- D. Maintain temporary signage so that signs are clean, legible, and upright. Cut grass, weeds, and other plants so that temporary signs are not covered or obscured.
- E. Repair or replace damaged temporary signs. Relocate signs as required by progress of the Project.

3.3. REMOVAL

- A. Remove temporary signs upon Substantial Completion, or as otherwise directed by the OWNER and PROFESSIONAL.

3.4. ATTACHMENTS

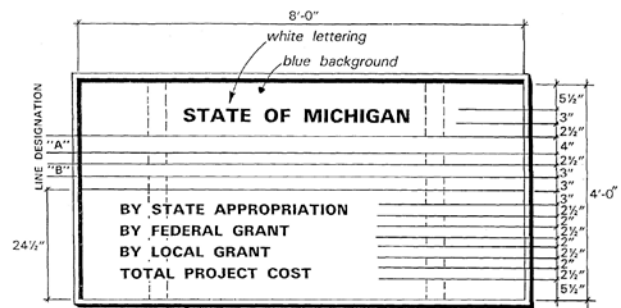
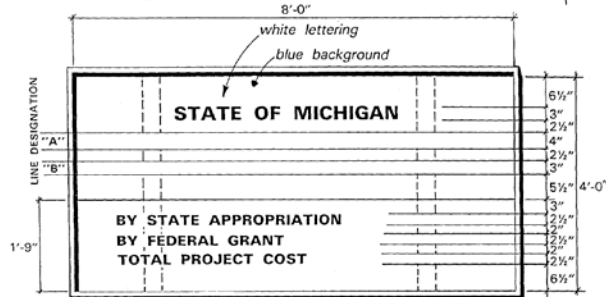
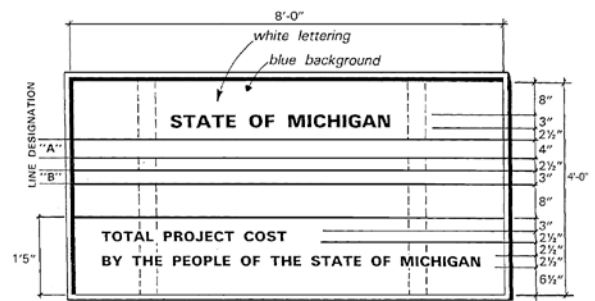
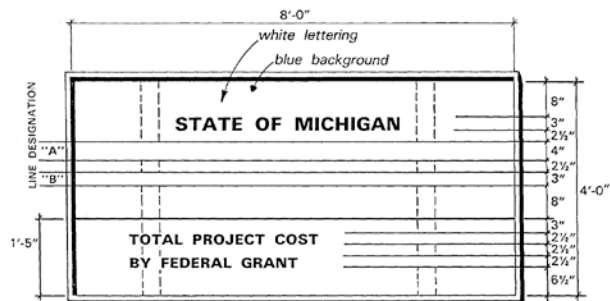
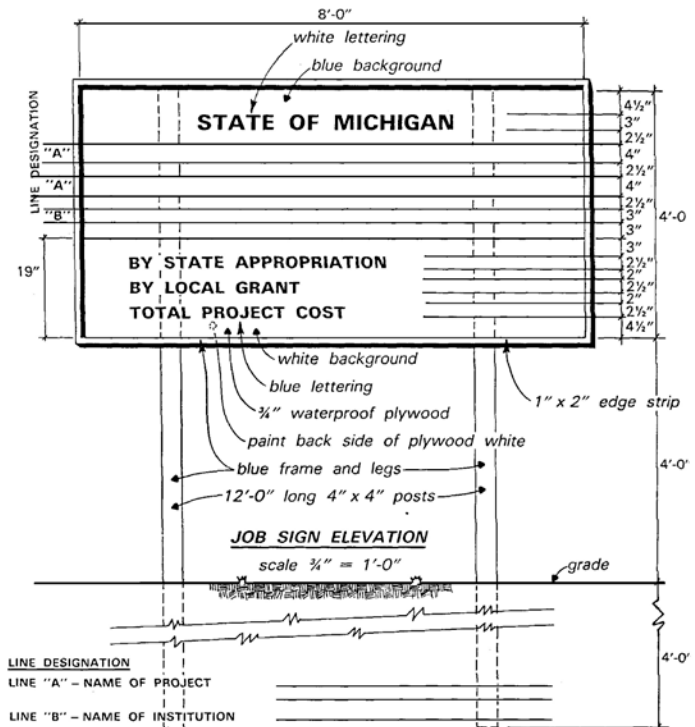
- A. The documents listed below, following the "End of Section" designation, are part of this Specification Section.
 - 1. Appendix 9, "Project Signs" from DTMB Capital Outlay Design Manual dated July 2013 (one page).

END OF SECTION

PROJECT SIGNS:

Five examples of project signs.
Sign lettering corresponds with the
funding arrangement of the project.
Alternate signs may be considered;
please contact the DTMB-FA
Project Director.

Provide a photo of the sign in the
initial monthly report.



SECTION 01 71 23

FIELD ENGINEERING

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
1. This Section includes field engineering, surveying, and layouts by CONTRACTOR, and associated requirements.
 2. CONTRACTOR shall provide field engineering services, surveying and layout services, and professional services of the types indicated for the Project, including:
 - a. Preparing Daily Field Reports and Weekly Construction Reports.
 - b. Developing and making all detail surveys and measurements required for construction; including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
 - c. Developing and making all bathymetric surveys and measurements required for construction.
 - d. Providing materials required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
 - e. Being solely responsible for all locations, dimensions and levels.
 - f. Rectifying all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
 - g. Providing such facilities and assistance necessary for PROFESSIONAL and Resident Project Representative or OWNER's Field Representative (if any) to check lines and grade points placed by CONTRACTOR. Do not perform excavation or backfill work until all cross-sectioning necessary for determining payment quantities for Unit Price Work have been completed and accepted by PROFESSIONAL.
- B. Coordination:
1. Review requirements of this and other Sections and coordinate installation of items to be installed with or before field engineering, surveying, and layout Work.

1.2. REFERENCES

- A. Hydrographic Surveying Engineering Manual, EM 1110-2-1003 prepared by United States Army Corps of Engineers (USACE) and dated November 30, 2013. The most recent version of this reference applies.

1.3. TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
1. Dredge Management Unit (DMU): A DMU is a portion of the sediment removal area identified to facilitate removal confirmation. DMUs are shown on the Drawings.

1.4. CONTRACTOR'S FIELD SUPERVISOR

- A. Employ and retain at the Site a field supervisor with experience and capability of performing all field engineering tasks required of CONTRACTOR, including:
1. Preparing and maintaining daily reports of activity on the Work including the following information, at minimum:

- a. Number of employees at the Site.
- b. Number employees at the Site for each Subcontractor.
- c. Major equipment and materials installed as part of the Work.
- d. Major construction equipment utilized.
- e. Location of areas in which construction was performed.
- f. Materials and equipment received.
- g. Work performed (and dredged material volumes), including field quality control measures and testing.
- h. Weather conditions.
- i. Safety concerns, events, and precautions taken. Attach a copy of the daily health and safety field report as required by Section 01 35 29.
- j. Delays encountered, amount of delay incurred, reasons for the delay, and corrective measure(s) implemented to maintain the Progress Schedule.
- k. Instructions received from PROFESSIONAL or OWNER.
2. Preparing and maintaining weekly summary reports of activity on the Work including the following information, at minimum:
 - a. Location of areas in which construction was performed.
 - b. Work performed (and dredged material volumes), including field quality control measures and testing.
 - c. Quantities of material transported offsite for disposal (include completed manifests received).
 - d. Water pre-treatment effluent data.
 - e. Safety concerns, events, and precautions taken.
 - f. Delays encountered, amount of delay incurred, reasons for the delay, and corrective measure(s) implemented to maintain the Progress Schedule.
 - g. Instructions received from PROFESSIONAL or OWNER.
3. Submit copies of CONTRACTOR's daily reports in accordance with Section 01 33 00, Submittal Procedures, on a daily basis and weekly reports on a weekly basis. Reports shall be signed by responsible member of CONTRACTOR's staff, such as CONTRACTOR's project manager or superintendent, or foreman designated by CONTRACTOR as having authority to sign reports.
4. Maintain field office files and drawings, record documents, and coordinate field engineering services with Subcontractors and Suppliers as appropriate. Prepare layout and coordination drawings for construction operations.
5. Check and coordinate the Work for conflicts and interferences, and immediately advise Design PROFESSIONAL and PROFESSIONAL, if any, of all discrepancies of which CONTRACTOR is aware.
6. Cooperate as required with OWNER and PROFESSIONAL in observing the Work and performing field inspections.
7. Review and coordinate the Work with Shop Drawings and CONTRACTOR's other submittals.

1.5. CONTRACTOR'S SURVEYOR

- A. Employ or retain the services, as needed, at the Site of a registered land surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work.
 1. Surveyor shall be a registered professional land surveyor (if performing a topographic survey) or Nationally Certified Hydrographer (if performing a bathymetric survey).
 2. Surveyor shall be authorized under Laws and Regulations to practice surveying and have actively engaged in topographic (if performing topographic survey) or bathymetric (if performing bathymetric survey) operations during the past 3 years.
- B. Surveyor's tasks include, but are not necessarily limited to, the following:
 1. Providing required surveying equipment and accessories in good working order.
 2. Being proficient in the proper operation and maintenance of survey equipment.

3. Establishing required lines and grades for performing the Work.
4. Preparing and maintaining professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the Work.
5. Complying with requirements of the Contract Documents relative to surveying and related work.

1.6. SUBMITTALS

- A. Field Engineering:
 1. Submit daily reports as indicated in this Section.
 2. When requested by OWNER or PROFESSIONAL, submit documentation verifying accuracy of field engineering.
- B. Surveying:
 1. Survey Plan: Complete plan for conducting survey work for record surveys and progress surveys, submitted ten days prior to beginning survey Work. Plan shall include:
 - a. Grid layout/tracklines and proposed identification scheme for nodes/tracklines to be surveyed as part of Work.
 - b. Specifications for survey equipment used in performing surveys.
 - c. Specifications for equipment positioning and visualization software, if used for progress reporting.
 - d. Example of proposed survey field books to be maintained by CONTRACTOR's surveyor. Example shall have sufficient information and detail, including example calculations and notes, to demonstrate that field books will be organized and maintained in a professional manner, complying with the Contract Documents.
 2. Survey Results:
 - a. Submit survey data in x, y, z (easting, northing, elevation) format. Each data file shall include a descriptive header including, but not limited to: software and equipment information, horizontal and vertical datum, units, survey type, alignment, and stations surveyed.
 - b. Submit a copy of the survey drawing with contour data in a format compatible with AutoCAD Civil 3D 2014 and in PDF.
 - c. Submit certified survey in accordance with this Section.
- C. Certificates: When requested by PROFESSIONAL, submit certificate signed by professional engineer or professional surveyor, as applicable, certifying that elevations and locations of the Work comply with the Contract Documents. Explain all deviations, if any.
- D. Qualifications Statements:
 1. Field Supervisor: Name and address. When requested by PROFESSIONAL, submit qualifications.
 2. Surveyor: Name and address of firm, and resumes of each professional land surveyor and crew chief conducting the survey Work. Submit at least ten days prior to beginning survey Work. During the Project, submit resume for each new registered land surveyor and crew chief employed by or retained by CONTRACTOR at least ten days prior to starting on the survey Work.

1.7. RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey Work as it progresses.
 1. Survey data shall be in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the locality where the Site is located. Original field notes, computations, and other surveying data shall be recorded by CONTRACTOR's surveyor in CONTRACTOR-furnished hard-bound field books, and shall be signed and sealed by CONTRACTOR's surveyor. Completeness and accuracy of survey Work, and completeness and accuracy of survey records, including field books,

- shall be responsibility of CONTRACTOR. Failure to organize and maintain survey records in an appropriate manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.
2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by PROFESSIONAL at CONTRACTOR's expense.
- B. Upon completion of major phases of Work, prepare two copies of the certified survey, signed and sealed by professional surveyor, showing dimensions, locations, angles and elevations of construction and locations and elevations of Underground Facilities encountered during the Work, if any.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. SURVEYING

- A. Reference Points:
1. Established reference points damaged or destroyed by CONTRACTOR will be re-established by CONTRACTOR at CONTRACTOR's expense.
 2. From established reference points, establish lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.
 3. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.
 4. For all surveys, use and report data in using the following:
 - a. Horizontal datum: North American Datum of 1983 (NAD 83), Michigan State Plane North Coordinate System
 - b. Vertical Datum: National Geodetic Vertical Datum of 1929 (NGVD 29)
- B. Surveys to Determine Quantities for Payment:
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of Work performed or placed. Perform surveys necessary for PROFESSIONAL to determine final quantities of Work in place.
 2. Quantities for final payment shall be based on certified survey performed using conventional survey methods.
 3. Notify PROFESSIONAL at least 24 hours before performing survey services for determining quantities. Unless waived in writing by PROFESSIONAL, perform quantity surveys in presence of PROFESSIONAL.
- C. Surveys for Progress Reporting:
1. CONTRACTOR's daily reports shall include information on progress of sediment removal and backfill as appropriate. Progress of sediment removal and backfill activities shall be measured using conventional survey techniques, equipment positioning and visualization software, or other method approved by the PROFESSIONAL.
 2. CONTRACTOR shall conduct and document the quality control procedures recommended by the equipment manufacture of the equipment positioning and visualization software, if used.
- D. Surveying: Comply with the following:

1. Bathymetric surveys shall be multi-beam sonar coupled with Real Time Kinematic Global Positioning System and hand soundings. Tracklines shall be spaced to achieve 100% overlap of the multi-beam survey data.
 2. Topographic surveys shall be collected on a 25- by 25-foot grid or wherever the elevation changes more than 1 foot. Survey shall document location of grade breaks and edges of construction areas as appropriate.
 3. Pre-Construction Survey:
 - a. The bathymetric survey performed in October 2015 shall be used as the pre-construction bathymetry for the purposes of the Work and the Contract Documents. Alternatively, the CONTRACTOR may perform an additional pre-construction bathymetric survey at no additional cost to the OWNER for review by the PROFESSIONAL to document conditions at the time of mobilization to the site. If CONTRACTOR elects to perform pre-construction bathymetric survey of dredge limits and surrounding area, the following requirements apply:
 - 1) Survey shall include location of significant debris, structures, or other features within and/or adjacent to the dredge area.
 - 2) Survey drawing shall include the pre-construction sediment elevation contours (1 foot resolution). Submit to PROFESSIONAL at least 2 weeks prior to start of dredging. Survey drawings showing bathymetry data shall be shown at scale not to exceed 1 inch equals 50 feet.
 - b. Perform pre-construction topographic survey of upland construction support areas to document existing area conditions.
 - c. Perform photographic survey of works areas to document pre-construction conditions of properties.
 4. Post-Removal Survey:
 - a. Perform post-removal bathymetric survey following completion of sediment removal activities in specific DMUs.
 - 1) Survey drawing shall include contours (1 foot resolution) showing confirmation of dredging to specified elevations within DMUs and tables showing actual removal volumes.
 - 2) Submit to PROFESSIONAL prior to the start of backfilling operations in any DMU and not more than 2 days after completion of dredging. Survey drawings showing bathymetry data shall be shown at scale not to exceed 1 inch equals 50 feet.
 5. Post-Construction Survey:
 - a. Perform post-construction bathymetric survey following completion of cover placement.
 - 1) Survey drawing shall include contours (1 foot resolution) showing confirmation that cover system was installed to specified elevation and tables showing actual cover volumes. Survey drawings showing bathymetry data shall be shown at scale not to exceed 1 inch equals 50 feet.
 - 2) Submit drawings to PROFESSIONAL not more than 2 weeks after completion.
 - b. Perform post-construction topographic survey of upland support areas to document areas restored to pre-construction conditions.
 - c. Perform photographic survey of works areas to document post-construction conditions of properties.
- E. Accuracy:
1. For topographic land surveys:
 - a. Horizontal accuracy shall be plus or minus 0.1 feet.
 - b. Vertical accuracy shall be plus or minus 0.05 feet for general site grading and 0.02 feet for structural features (e.g. pipes, manholes) unless otherwise specified or approved by PROFESSIONAL.
 2. Bathymetric survey accuracy shall be in accordance with Chapter 4 from the Hydrographic Surveying Engineering Manual.

3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. Section Includes.
 - a. Substantial Completion.
 - b. Final inspection.
 - c. Final payment and acceptance of the Work.

1.2. SUBSTANTIAL COMPLETION

- A. Substantial Completion – General:
 - 1. CONTRACTOR must notify the PROFESSIONAL, the Project Director and the Agency when the Work will be substantially complete. Prior to requesting Substantial Completion, perform the following for the substantially completed Work:
 - a. Materials and equipment for which Substantial Completion is requested shall be fully ready for their intended use, including full operating and monitoring capability in automatic and manual modes.
 - b. Complete field quality control Work, including testing at the Site, indicated in Specifications Sections for individual materials and equipment items. Submit results of, and obtain PROFESSIONAL's acceptance of, field quality control tests required by the Contract Documents.
 - c. Cleaning for Substantial Completion shall be completed in accordance with Part 1.2.B of this Section.
 - d. Complete other tasks that the Contract require be completed prior to Substantial Completion.
 - 2. If the PROFESSIONAL, OWNER, and Agency agree that the project is Substantially Complete, the PROFESSIONAL and Project Director will inspect the Work. The PROFESSIONAL, upon determining that the Work, or a portion of the Work inspected, is substantially complete, will prepare a Punch List and will attach it to the respective Certificate of Substantial Completion.
 - 3. CONTRACTOR must be represented on the job site at the time this inspection is made and thereafter must complete all Work by the date set for final acceptance by the OWNER.
- B. Final Cleaning: Before final acceptance by the OWNER, CONTRACTOR must clean all of the Work and existing surfaces, building elements and contents that were soiled by their operations and make repairs for any damage or blemish that was caused by the Work.

1.3. FINAL INSPECTION

- A. Close-out Documents:
 - 1. CONTRACTOR must prepare and submit the following documentation, as applicable, before requesting final inspection or final payment:
 - a. Final operating and maintenance documentation (with revisions made after Substantial Completion).
 - b. Warranties.
 - c. Inspection certificates.
 - d. Record Documents (in accordance with Section 01 78 39).

- e. Release of payment claim forms.
 - f. All other documents required by the Contract Documents.
- B. Request for Final Inspection:
- 1. CONTRACTOR must complete the Substantial Completion Punch List within the Contract Time and date.
 - 2. CONTRACTOR must assemble all required documentation before requesting final inspection.
 - 3. CONTRACTOR may request final inspection of the entire Work, or the part of the Work for which final payment is specified in the Contract Documents.
 - 4. Upon this written notice, and if deemed appropriate by the PROFESSIONAL, the PROFESSIONAL will make a final completion inspection with the OWNER and CONTRACTOR and notify CONTRACTOR of all incomplete or Defective Work revealed by the Final Inspection.
 - 5. CONTRACTOR must immediately correct and complete the Work.

1.4. FINAL PAYMENT AND ACCEPTANCE:

- A. Request for Final Payment:
- 1. CONTRACTOR may request final payment after correcting or completing the Work to the satisfaction of the PROFESSIONAL and delivering close-out documentation (Part 1.3.A).
 - 2. CONTRACTOR's request for final payment must also enclose:
 - a. Evidence of completed operations insurance and an affidavit certifying that the insurance coverage will not be canceled, materially changed, or renewal refused.
 - b. Affidavit certifying that the surety agrees that final payment does not relieve the surety of any of its obligations under the Performance Bond and Payment Bond.
 - c. Completed DTMB-0460 Form close out checklist.
 - d. List of all pending insurance claims arising out of or resulting from the Work being handled by CONTRACTOR and/or its insurer
 - e. CONTRACTOR's 'Guarantee and Statement' (DTMB-0437) containing a statement of guaranteed indebtedness acceptable to the OWNER in the full amount of the Contract Price, or a release of payment claims in the form of a release of liens, or a Bond or other security acceptable to the OWNER to indemnify the OWNER against any payment claim.
- B. Final Payment and Acceptance:
- 1. If the PROFESSIONAL is satisfied that the entire Work, or the part of the Work for which final payment is specified in the Contract Documents, is complete and CONTRACTOR's other obligations under the Contract Documents has been fulfilled, the PROFESSIONAL will furnish to the OWNER and CONTRACTOR the PROFESSIONAL's certification of final payment and acceptance within thirty Calendar Days after receipt of the final payment request. If the PROFESSIONAL is not satisfied, the PROFESSIONAL will return the request to CONTRACTOR indicating in writing the reasons for not certifying final payment. If the final payment request is returned, CONTRACTOR must correct the deficiencies and re-request final payment.
 - 2. If the OWNER concurs with the PROFESSIONAL's certification of final payment the OWNER will, within thirty Calendar Days after receipt of the PROFESSIONAL's certification of final payment, pay the balance of the Contract Price subject to those provisions governing final payment specified in the Contract Documents. If the OWNER does not concur with the PROFESSIONAL's determination, the OWNER will return the request for final payment to CONTRACTOR with written reasons for refusing final payment and acceptance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. This Section includes supplemental requirements for Project record documents.
 - 2. CONTRACTOR shall provide all labor, materials, equipment, and services to maintain and submit to PROFESSIONAL Project record documents in accordance with the Contract Documents.
- B. Maintenance of Record Documents:
 - 1. Maintain in field office, in clean, dry, legible condition, complete sets of the following record documents:
 - a. Drawings, Specifications, and Addenda
 - b. Shop Drawings, Samples, and other CONTRACTOR submittals, including records of test results, and status of PROFESSIONAL's review
 - c. Change Orders, Work Change Directives, Field Orders, copies of all interpretations and clarifications issued
 - d. Photographic documentation
 - e. Survey data
 - f. All other documents pertinent to the Work.
 - 2. Provide files and racks for proper storage and easy access to record documents. File record documents in good order and annotated in a neat and legible manner using a contrasting, reproducible color in accordance with the General Conditions.
 - 3. Promptly make record documents available for observation and review upon request of PROFESSIONAL or OWNER.
 - 4. Do not use record documents for any purpose other than serving as Project record.
 - 5. Do not remove record documents from field office without PROFESSIONAL's approval.

1.2. SUBMITTALS

- A. Record Documents:
 - 1. Submit the following Project record documents:
 - a. Drawings.
 - b. Project Manual including Specifications and Addenda (bound).
 - 2. Prior to readiness for final payment, submit to PROFESSIONAL one copy of final record documents and obtain PROFESSIONAL's acceptance of same. Submit complete record documents; do not make partial submittals.
 - 3. Submit both printed record documents and electronic record documents, in accordance with the Contract Documents.
 - 4. Submit record documents with transmittal letter on CONTRACTOR letterhead in accordance with requirements in Section 01 33 00, Submittal Procedures.
 - 5. Record documents submittal shall include the following certification, with original signature of official authorized to execute legal agreements on behalf of CONTRACTOR, reading as follows:

"[Insert CONTRACTOR's corporate name] has maintained and submitted record documentation in accordance with Section 01 78 39, Project Record Documents and other elements of Contract Documents, for the Manistique River Area of Concern: OU1 (Zones 3 and 4) Dredging Project, Manistique, Michigan. We certify that each record document submitted is complete, accurate, and legible

relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.
[Provide signature, print name, print signing party's corporate title, and date]"

1.3. RECORDING CHANGES

A. General:

1. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters.
2. Keep record documents current. Make entries on record documents within two working days of receipt of information required to record the change.
3. Do not permanently conceal the Work until required information has been recorded.
4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from PROFESSIONAL-accepted record documents.
5. Marking of Entries:
 - a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
 - b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files in portable document format (".PDF").
 - c. Date each entry on record documents.
 - d. Indicate changes by drawing a "cloud" around the change(s) indicated.
 - e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:

1. Record changes on copy of the Drawings. Submittal of CONTRACTOR-originated or produced drawings as a substitute for recording changes on a copy of the Drawings is unacceptable.
2. Record changes on plans, sections, elevations, schematics, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.
3. Record actual construction including:
 - a. Depths of Work elements relative to Project datum.
 - b. Horizontal and vertical location of Underground Facilities referenced to permanent surface improvements and project elevation datum.
 - c. Horizontal and vertical locations of installations of any kind or description known to exist within the Work area. Locations shall include dimensions of permanent features.
 - d. Field changes of dimensions, elevations, arrangements, and details.
 - e. Changes made in accordance with Change Orders, Work Change Directives, and Field Orders.
 - f. Changes in details on the Drawings. Submit additional details prepared by CONTRACTOR when required to document changes.
4. Supplemental Drawings:
 - a. In some cases, drawings produced during construction by PROFESSIONAL or CONTRACTOR supplement the Drawings and shall be included with record documents submitted by CONTRACTOR. Supplemental record drawings shall include drawings provided with Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings due to space limitations.
 - b. Supplemental drawings provided with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.

- c. When supplemental drawings developed by CONTRACTOR using computer-aided drafting/design (CADD) software are to be included in Record Drawings, submit electronic files for such drawings in AutoCAD 2014 as part of record drawing submittal. Submit electronic files on compact disc labeled, "Supplemental Record Drawings", with CONTRACTOR name, Project name, and Contract name and number.
- C. Specifications and Addenda:
 - 1. Mark each Section to record:
 - a. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually provided.
 - b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.4. ELECTRONIC FILES FURNISHED BY PROFESSIONAL

- A. CADD files of the Drawings will be furnished by PROFESSIONAL upon the following conditions:
 - 1. CONTRACTOR shall submit to PROFESSIONAL a letter on CONTRACTOR letterhead requesting CADD files of the Drawings and providing specific definition(s) or description(s) of how files will be used, and specific description of benefits to OWNER (including credit proposal, if applicable) if the request is granted.
 - 2. CONTRACTOR shall execute PROFESSIONAL's standard agreement for release of electronic files and shall abide by all provisions of the agreement for release of electronic files.
 - 3. Layering system incorporated in CADD files shall be maintained as transmitted by PROFESSIONAL. CADD files transmitted by PROFESSIONAL containing cross-referenced files shall not be bound by CONTRACTOR. Design Drawing cross-references and paths shall be maintained. If CONTRACTOR alters layers or cross-reference files, CONTRACTOR shall restore all layers and cross-references prior to submitting record documents to PROFESSIONAL.
 - 4. CONTRACTOR shall submit record drawings to PROFESSIONAL in same CADD format that files were furnished to CONTRACTOR.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02 61 10

HANDLING AND DISPOSAL OF IMPACTED MATERIALS

PART 1 GENERAL

1.1. DESCRIPTION

A. Scope:

1. Furnish all labor, materials, tools, equipment, transportation, accessories, and appurtenances necessary to perform handling, transporting, dewatering, and disposal of wastes including, but not limited to, sediment and debris. The Work described in this section includes:
 - a. Handling, transport, mixing, and dewatering, as required, of removed non-TSCA sediment to develop a homogeneous mixture to render the materials suitable for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill, approved by the PROFESSIONAL.
 - b. Handling, transport, mixing, and dewatering, as required, of removed TSCA sediment to develop a homogeneous mixture to render the materials suitable for offsite disposal at the PROFESSIONAL-approved disposal facility licensed to receive TSCA waste.
 - c. Handling, transport, mixing, and dewatering, as required, of all generated waste streams as a result of the construction activities including, but not limited to, excavation, debris removal, and residual wastes and general refuse generated by CONTRACTOR and PROFESSIONAL.
2. CONTRACTOR shall be responsible for obtaining the appropriate permits and equipment necessary for the transportation of waste materials.
3. Water generated during the waste management process will be treated in the onsite pre-treatment system prior to discharge, in accordance with Section 02 73 00.

B. Related Sections:

1. Section 01 11 00, Summary of Work.
2. Section 01 33 00, Submittal Procedures.
3. Section 01 41 00, Regulatory Requirements.
4. Section 01 55 13, Access Roads and Support Areas.
5. Section 01 57 00, Temporary Controls.
6. Section 01 71 23, Field Engineering.
7. Section 01 77 00, Closeout Procedures.
8. Section 02 73 00, Wastewater Handling and Disposal.
9. Section 35 20 23, Dredging and Cover.

1.2. REFERENCES

- A. Arcadis. 2016. Operable Unit 1: Final Design Report. Manistique Area of Concern, Schoolcraft County, Michigan. April.
- B. USEPA. 2004. Method 9095B Paint Filter Liquids Test, Revision 2. November. Available at: <http://www.epa.gov/solidwaste/hazard/testmethods/sw846/pdfs/9095b.pdf>.

1.3. QUALITY ASSURANCE

- A. CONTRACTOR shall participate in and conform to all items and requirements of the quality assurance program as outlined in this Specification, and in the Contract Documents.

1.4. SUBMITTALS

- A. Submit a Material Handling and Disposal Plan to the PROFESSIONAL for review and approval, which will include means and methods for material handling, transport, dewatering, and disposal for review and approval by the PROFESSIONAL. The information shall include, but not limited to, the following:
1. Description of onsite sediment and debris handling and transport, including from the offloading location to the dewatering pad, and in-between staging areas.
 2. Description of the approach, including equipment, methods, layout, and sequence, for management, stockpiling, and dewatering of waste materials on the dewatering pad and/or other ancillary pads.
 3. Technical specifications including but not limited to materials, dimensions, manufacturer and vendor information, installation, verification, and construction methods for the dewatering pad, contingency storage pad, if needed, and any other constructed surface required for handling and disposal of waste materials.
 4. Proposed drying agent (e.g., calcium oxide, Portland cement or other approved drying agent) and approach for use of drying agent.
 5. Description and results of Pilot Study for any material drying test, if performed prior to the construction.
 6. Proposed odor control materials, equipment, and approach, if required.
 7. Description of all necessary containment systems for waste material staging.
 8. Description of all necessary measures and materials for covering stockpiles and limiting exposure of waste materials to inclement weather.
 9. Description of the equipment, methods, layout, location, and sequencing for loading trucks for offsite waste transport and disposal.
 10. Description of the number and type of trucks or other vehicles to be used for onsite and offsite waste transport.
 11. Description and specifications of truck and/or container liners and covers, and procedures for the installation of container liners and covers.
 12. The name, location, contact name, and permit number for disposal facilities to be used.
 13. The name, contact name, and permit number for the waste hauling subcontractor, if applicable.
- B. Provide waste manifests to the PROFESSIONAL for review and approval prior to the transport of waste offsite.
- C. Submit daily reports to the PROFESSIONAL, in accordance with the Construction Quality Assurance Plan, which will provide a daily summary of waste transported offsite, including, but not limited to, quantity and type waste removed (e.g., non-TSCA sediment, TSCA sediment, debris, and vegetation etc.), quantity and type of material delivered to the dewatering pad, quantity of dredged sediment solidified, quantity of drying agent used (by ton and percent of agent added), quantity and type of waste staged at the Site, quantity and type of waste transported offsite for disposal, and results of the Paint Filter Tests.
- D. Shipping receipts, including both weight and volume for all waste materials delivered to the site, shall also be submitted to the PROFESSIONAL on a daily basis.
- E. CONTRACTOR shall provide waste disposal certifications to the PROFESSIONAL upon receipt from disposal facility.

PART 2 PRODUCTS

2.1. DRYING AGENT

- A. CONTRACTOR shall provide drying agent in sufficient quantity to complete the sediment dewatering activities as specified, without delay.

- B. Acceptable products shall be calcium oxide, Portland cement, or other product approved by the PROFESSIONAL prior to acquisition, shipment to the Site, and use.

2.2. CONTAINERS

- A. CONTRACTOR shall inspect all containers used for staging and transporting the waste material upon arrival to ensure they are in good condition (i.e., clean, no damage).
- B. The containers used for offsite waste transport shall be watertight and sift-proof, with a cover, suitable for truck service, and meet local, state, and federal regulations.

2.3. COVERS AND LINERS

- A. CONTRACTOR shall use container liners (6-mil polyethylene sheeting) to provide separation between the waste and containers, including truck boxes.
- B. CONTRACTOR shall cover all trucks or open-top containers used for offsite transport with a soft pull-tarp cover mounted on the truck or container. The tarp shall extend over the truck or container and shall be secured in accordance with United States Department of Transportation standards.

PART 3 EXECUTION

3.1. GENERAL

- A. CONTRACTOR shall adhere to local, state, and federal regulations that pertain to transportation and traffic control.
- B. CONTRACTOR shall handle, transport, unload, treat, and dispose of waste in a manner that is protective of the environment and public health and safety.
- C. CONTRACTOR shall be responsible for management and tracking of waste materials and material handling equipment, from the offloading location to the dewatering pad, in-between staging areas, and to approved offsite disposal facilities.
- D. CONTRACTOR shall label all temporary waste storage containers and areas with the contents.
- E. CONTRACTOR shall be responsible for characterizing waste streams, as required by the approved offsite disposal facilities.
- F. CONTRACTOR shall not transport wastes offsite until the waste manifests and transport have been approved by the PROFESSIONAL.
- G. CONTRACTOR shall be responsible for completion, management, and tracking of all transportation and disposal documentation, including bills of lading, waste manifests, inventory and location information, and certificates of disposal.
- H. CONTRACTOR shall be responsible for the offsite logistics and will have direct accountability to the PROFESSIONAL.

3.2. MATERIAL HANDLING

- A. Load, handle, and/or transport waste material in a manner that prevents spillage or spreading of these materials.

- B. Immediately clean up any waste spilled or spread into non-contaminated areas in accordance with Section 01 57 00, Temporary Controls and Section 35 20 23, Dredging and Cover.
- C. All transportation shall be performed in water-tight containers that prevent leakage of sediment, debris, and free liquids. CONTRACTOR shall load containers only to a volume that can safely be transported and minimize possible spillage due to material shifting. Provide sufficient freeboard to prevent spillage during transport.

3.3. DEWATERING

- A. CONTRACTOR shall construct the dewatering area and support areas as shown in the Drawings and described in the Section 01 55 13, Access Roads and Support Areas.
- B. CONTRACTOR shall manage sediments within the dewatering pad to promote gravity dewatering or dewatering of sediment within geosynthetic bags. CONTRACTOR shall install interior barriers (e.g., Jersey barriers), approved by the PROFESSIONAL, as necessary, to segregate non-TSCA and TSCA sediment processing areas and limit dewatering fluid from wet materials from contacting drier materials. CONTRACTOR may propose an alternate sediment dewatering process to the PROFESSIONAL for approval.
- C. If sediment will be dewatered by geosynthetic bags, CONTRACTOR shall be responsible for performing treatability testing and provide appropriate polymers for coagulation/flocculation of sediment slurry. Additionally, contractor will be responsible for removing material from the bags once the appropriate solids content is achieved and disposing of the material in accordance with this Section.
- D. CONTRACTOR shall, at all times, provide and maintain proper and satisfactory means and devices for directing water currently present within and/or entering the dewatering pad to sumps.
- E. CONTRACTOR shall be responsible for monitoring and maintenance of the dewatering pad sumps.
- F. CONTRACTOR shall collect, manage, and properly treat wastewater generated during dewatering in the onsite pre-treatment system in accordance with Section 02 73 00, Wastewater Handling and Disposal.

3.4. ADDITION OF DRYING AGENT

- A. CONTRACTOR shall mix the appropriate quantities of drying agent, up to 10 percent by weight, unless otherwise approved by the PROFESSIONAL, so that dewatered sediments pass the Paint Filter Liquids Test, as defined in U.S. Environmental Protection Agency Method 9095B and meet all other requirements of the selected disposal facility prior to offsite transport and disposal.
- B. Sediment on the dewatering pad shall be mixed with an approved drying agent using a mechanical mixer or by using locally available construction equipment (e.g., excavator), or an alternate method as approved by the PROFESSIONAL.
- C. CONTRACTOR shall provide a means for accurate measurement and documentation for tracking quantities of drying agent added to sediment.
- D. Stockpiled dewatered sediment awaiting disposal shall be covered with plastic sheeting such that it is protected from precipitation, to prevent migration of contaminants to clean media, and to mitigate fugitive dust generation.

3.5. OFFSITE TRANSPORT

- A. Load, handle, and/or transport sediment and debris, or other potentially contaminated material in a manner that prevents spillage or spreading of these materials.
- B. Prior to loading trucks or other containers for offsite transport and disposal, the containers shall be lined properly as described in Part 2.3 of this Section.
- C. All transports that travel public roads shall be gross vehicle weight legal and comply with all federal, state, and local vehicle transport standards and regulations.
- D. All transportation shall be performed in water-tight containers that prevent leakage of sediment, debris, and free liquids. CONTRACTOR shall load containers only to a volume that can safely be transported and minimize possible spillage due to material shifting. Provide sufficient freeboard to prevent spillage during transport travel.
- E. All transport beds or open-top containers shall be securely closed and tarped before leaving their point of loading. Transports shall remain closed and tarped until the transport arrives at the approved offsite disposal facilities.
- F. All transports leaving the Site shall have all visible mud and waste removed prior to leaving the Site. Each transports leaving the Site will be inspected and decontaminated (i.e., wheel wash, manual removal of lumps/debris etc.), as necessary, by CONTRACTOR.
- G. A visual inspection of each container will be performed at the disposal or transload facilities to verify that liners have performed properly. If the liners have performed properly, container cleaning will not be required. If liner failure has occurred, investigation into the cause and container cleaning or container replacement will be required.

3.6. DISPOSAL

- A. CONTRACTOR shall transport dewatered sediment to the approved offsite disposal facilities for disposal.
 - 1. Pre-approved disposal facilities are listed below
 - a. TSCA Material Disposal Facility(ies):
 - 1) Wayne Disposal, Inc. (Belleville, Michigan)
 - 2) Safety Kleen Oil Recovery Co. (Twinsburg, Ohio)
 - b. Non-TSCA Material Disposal Facility(ies):
 - 1) MPI Acquisition Landfill (Manistique, Michigan)
 - 2. CONTRACTOR may propose alternate locations for approval by OWNER and PROFESSIONAL. CONTRACTOR will be required to provide all waste characterization requirements for the proposed disposal facility and demonstrate that the alternate proposed disposal facility(ies) is a more efficient and effective disposal option.
- B. CONTRACTOR shall take control measures to ensure any free liquid that may potentially be liberated from sediment during truck transport is not released from the trucks.

3.7. DEBRIS DISPOSAL

- A. CONTRACTOR shall segregate debris intermingled with sediment to the extent practicable.
- B. Debris removed from TSCA removal areas shall be treated as TSCA waste.
- C. Debris shall be adequately rinsed to remove adhered sediment, as determined by the PROFESSIONAL.

- D. Non-porous debris that has been appropriately decontaminated may be re-purposed or recycled with approval from OWNER/PROFESSIONAL.
- E. Non-impacted slab wood (i.e. wood removed from the banks or floating wood) may be re-purposed or recycled with approval from OWNER/PROFESSIONAL.
- F. Wood debris or other porous debris that is in contact with sediment shall be transported to and disposed of at the approved offsite disposal facilities in accordance with the classification associated with the sediment targeted for removal in the area in which the debris is encountered (TSCA vs non-TSCA sediment dredging areas).
- G. CONTRACTOR shall verify the debris does not release free water prior to truck loading and offsite transport.

END OF SECTION

SECTION 02 73 00

WASTEWATER HANDLING AND DISPOSAL

PART 1 GENERAL

1.1. DESCRIPTION

A. Scope:

1. Provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to provide, construct, operate, monitor, and maintain the onsite pre-treatment system for the duration of the Project. The treatment system shall treat all wastewater collected, extracted, or otherwise generated during the Project (e.g., from material dewatering, decontamination of equipment, stormwater accumulation within support areas, barge decant water) to non-detect concentrations of total PCBs and total mercury, and to the applicable discharge criteria established by the City of Manistique.
2. Transport treated wastewater to the City of Manistique Wastewater Treatment Plant (WWTP) located at 321 Trader's Point Drive, Manistique, Michigan, in accordance with applicable Discharge Permit limits as approved by the PROFESSIONAL and OWNER. The CONTRACTOR will obtain the necessary industrial discharge contract (herein referred as "Discharge Permit") from the City of Manistique for the discharge of pre-treated wastewater from the onsite pre-treatment system to the WWTP. The CONTRACTOR shall perform influent and effluent sampling and reporting required by the Discharge Permit. Under no circumstances shall treated wastewater be reused onsite for any purposes, including but not limited to dust suppression and equipment/personnel decontamination activities.

B. Related Sections:

1. Section 01 33 00, Submittal Procedures.
2. Section 01 35 29, CONTRACTOR's Health and Safety Plan.
3. Section 01 41 00, Regulatory Requirements.
4. Section 01 55 13, Access Roads and Support Areas.
5. Section 01 71 23, Field Engineering.

1.2. REFERENCES

- A. Arcadis. 2016. Operable Unit 1: Final Design Report. Manistique Area of Concern, Schoolcraft County, Michigan. April.
- B. Sewer Use Ordinance, City of Manistique, Michigan, Ordinance No. 175 of 1978 effective June 1, 1978.

1.3. DEFINITIONS

- A. Discharge Permit: Discharge Permit refers to the requirements specified within the Industrial Discharge Contract from the City of Manistique, Michigan Municipal Corporation obtained by the CONTRACTOR for the pre-treatment and/or treatment system operated by the CONTRACTOR as the permitted discharger.

1.4. QUALITY ASSURANCE

A. Qualifications of Manufacturers:

1. Materials and methods shall comply with relevant standards, codes, or specifications applicable to the design, construction, operation, and maintenance of the onsite pre-treatment system and/or associated wastewater conveyance systems.
2. Products used for the temporary wastewater treatment system shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the PROFESSIONAL.

B. Qualifications of Workers:

1. The trained system operator will be thoroughly familiar with the operation and maintenance of the onsite pre-treatment system and associated conveyance system specified in the requirements and the materials and methods described herein and will direct Work performed under this Section.
2. Other workers shall be skilled in the necessary crafts applicable to the operation and maintenance of the onsite pre-treatment system and associated conveyance system and properly informed of the methods and materials to be used.

1.5. SUBMITTALS

A. Pre-Construction Submittals:

1. CONTRACTOR shall submit a Wastewater Treatment Work Plan to the PROFESSIONAL for review and approval, within 21 days of the notice to proceed. This plan shall include shop drawings and all information that substantiates that the proposed system can be operated successfully to meet the Discharge Permit requirements. Such information includes, but is not limited to, the following:
 - a. Description of onsite pre-treatment system unit processes and basis of design.
 - b. Technical details related to the onsite wastewater conveyance system to collect wastewater from the dewatering pad and stormwater that has contacted potentially contaminated media.
 - c. Means and methods for offsite transportation or conveyance of treated wastewater from the Site to the City of Manistique WWTP (e.g., water trucks or piping and pumps).
 - d. Mobilization, installation, initial startup and testing of the onsite pre-treatment system.
 - e. Normal (daily) operations, troubleshooting, and shutdown procedures.
 - f. Overall system layout (process flow diagram).
 - g. Design flow rate and equipment capacity.
 - h. Anticipated peak flows and wastewater storage capacity to accommodate peak flows.
 - i. Anticipated ability to meet effluent limits.
 - j. Estimated quantity of treatment residuals that will be generated for disposal or regeneration.
 - k. Calculations supporting the sizing and design of the onsite pre-treatment system unit processes, including flow rates and design criteria for each unit process.
 - l. Figure showing location of system components within the Site.
 - m. Technical details relating to the construction and maintenance of the containment area.
 - n. Cut sheets and technical details for each system component and for each treatment media or product.
 - o. Equipment type, size, dimensions, and materials of construction for all system components.
 - p. Pumping and piping types, sizes, connections, and general layout.
 - q. Electrical requirements and service connections, wiring diagrams, and schematics.

- r. Elementary control diagrams.
 - s. Proposed supplier and model number.
 - t. Maintenance Plan.
 - u. Monitoring and maintenance requirements for system components.
 - v. Inspection schedules, including visual inspection of piping, fittings, pumps, equipment, and onsite pre-treatment system containment area.
 - w. Recommended spare parts list.
 - x. Calibration and alignment information.
 - y. Care and cleaning of surfaces.
 - z. Winterization plan and winter operation procedures.
 - aa. Corrective actions and contingency measures for process upsets, exceedances of discharge limits, and non-compliance with performance requirements.
 - bb. Safety Data Sheets (SDSs).
 - cc. Daily operations log form.
2. CONTRACTOR shall submit a Wastewater Treatment Operations Training Plan to the PROFESSIONAL for review and approval. The Training Plan shall identify means and methods that CONTRACTOR proposes to utilize in training CONTRACTOR personnel to operate and maintain the onsite pre-treatment system.
3. CONTRACTOR shall submit a list of trained staff and their responsibilities for the onsite pre-treatment system.

B. Construction Submittals

1. Submit a report on Initial Startup and Testing within 7 days of completion of the Initial Startup and Testing as specified in Part 3.4.
2. CONTRACTOR shall maintain (throughout the course of the Project) a written record of the operation and maintenance activities associated with the onsite pre-treatment system and associated wastewater conveyance systems. Such information shall be tabulated, updated daily, and submitted on a daily basis to the Resident Project Representative for review and included in the daily field reports. At a minimum, the summary shall include the following information (for each day):
 - a. Hours of operation.
 - b. Volume and types of wastewater collected and treated.
 - c. Volume of treated wastewater discharged and times of discharge to the City of Manistique WWTP.
 - d. Mode of discharge (i.e., batch or continuous).
 - e. Type and frequency of monitoring and maintenance activities (if any).
 - f. Other information relevant to the operation, monitoring, and maintenance of the onsite pre-treatment system and management systems.
 - g. All measurements and records, including but not limited to system pressure, sample field parameters (i.e., pH, turbidity, etc.) listed in the Discharge Permit reported wastewater levels in sumps, holding tanks and within treatment equipment.
3. CONTRACTOR shall provide onsite pre-treatment system effluent data (e.g., discharge rates, volumes, times of discharge, discharge locations, sample data, etc.) to the PROFESSIONAL in a Microsoft® Office compatible format as a part of the Weekly Construction Report.
4. All wastewater treatment and wastewater management monitoring data shall be submitted to the PROFESSIONAL in digital format at completion of the Work.
5. Copies of field notes, including field observations, system inspections and calibration, and all records of maintenance and repair activities conducted, will be provided upon the request of the PROFESSIONAL or OWNER.

1.6. STORAGE AND PROTECTION

- A. Use all means necessary and reasonably possible to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of other Contractors.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the PROFESSIONAL and at no additional cost to the OWNER.
- C. Deliver all materials to the Site in their original unopened containers with labels intact and legible at time of use. Store in strict accordance with the Manufacturer's recommendations and as approved by the PROFESSIONAL.
- D. Inspect all delivered materials to confirm they comply with the requirements of this Section.
- E. Store and handle material in such a manner as to avoid damage; store at the Site under cover.
- F. CONTRACTOR shall be responsible for all costs of warranty repair work, including removal, shipping, reinstallation, and re-startup during the warranty period.

PART 2 PRODUCTS

2.1. ONSITE PRE-TREATMENT SYSTEM

- A. CONTRACTOR shall propose the onsite pre-treatment system unit processes and design in the Wastewater Treatment Work Plan for review by the PROFESSIONAL for conformance with the Contract Documents. CONTRACTOR shall provide an onsite pre-treatment system that at a minimum includes the following:
 - 1. Tanks for storage of untreated wastewater.
 - 2. Influent sampling port.
 - 3. Treated effluent sampling port.
 - 4. Tanks for storage of treated wastewater.
 - 5. Influent and effluent flow totalizers.
 - 6. Treatment processes, including but not limited to treatment equipment and vessels, media and any other products or materials needed to achieve non-detect concentrations of total PCBs and total mercury and comply with the Discharge Permit requirements.
 - 7. Onsite wastewater conveyance system required to collect the wastewater for treatment and to transfer treated wastewater to storage tanks.
 - 8. Wastewater conveyance system to transport treated wastewater to the City of Manistique WWTP.
 - 9. All necessary piping, appurtenances, instrumentation, and pumps.
- B. The onsite pre-treatment system shall have adequate capacity to:
 - 1. Store and treat the volume of wastewater generated on a daily basis, including:
 - a. The volume of wastewater generated during sediment decanting and dewatering, including water accumulated in dredge barges.
 - b. The volume of stormwater that contacts potentially contaminated media.
 - c. The volume of decontamination water generated as a result of the Work.
 - 2. Store treated wastewater until treated wastewater demonstrates compliance with the Discharge Permit requirements and approval to discharge treated wastewater to the City of Manistique WWTP is granted.
 - 3. Store treated wastewater in excess of the allowable daily discharge approved by City of Manistique WWTP, currently anticipated to be 100,000 gallons or as otherwise indicated in the Discharge Permit.

- C. The onsite pre-treatment system shall be capable of pre-treating wastewater generated to meet the following:
 - 1. Discharge Permit effluent requirements.
 - 2. Non-detect PCB concentrations.
- D. Throughout the duration of the Project, CONTRACTOR shall be responsible for providing additional equipment, media, products, and materials or their replacements, as necessary, to operate and maintain the onsite pre-treatment system.

PART 3 EXECUTION

3.1. INSTALLATION AND GENERAL REQUIREMENTS

- A. All equipment shall be installed in strict compliance with the Manufacturer's installation instructions and the Wastewater Treatment Work Plan.
- B. The onsite pre-treatment system shall be constructed within a containment area to collect miscellaneous wastewater that may leak/leave onsite pre-treatment system prior to treatment (e.g., leaks in hose or pipe connections). The containment area shall be constructed in accordance with the details provided in the approved Wastewater Treatment Work Plan and shall accommodate a volume of wastewater equal to 1.5 times the total capacity of the onsite pre-treatment system. Accumulated water within the containment area shall be collected and treated.
- C. CONTRACTOR shall provide power and electrical service connection(s) as appropriate to operate, and maintain the onsite pre-treatment system and associated wastewater conveyance systems. Such service shall be installed in accordance with applicable federal, state, and local regulations and requirements.
- D. CONTRACTOR shall be responsible for routine inspection of all components of the onsite pre-treatment system for leaks. Leaks (if observed) shall be addressed by CONTRACTOR (including any required cleanup actions) immediately upon observation.
- E. CONTRACTOR shall be responsible for winterizing all equipment, tanks, piping, valves, instruments, and appurtenances when needed, so that the onsite pre-treatment system will remain functional when temperatures are below freezing.
- F. Free liquids collected from dewatering of dredged materials prior to disposal shall be collected and treated by the onsite pre-treatment system prior to discharge to the City of Manistique WWTP.
- G. Decontamination water and stormwater that has contacted contaminated media will require handling and treatment. These liquids shall be collected and treated by the onsite pre-treatment system.

3.2. INITIAL STARTUP AND TESTING

- A. After mobilization and setup of the onsite pre-treatment system, CONTRACTOR shall perform system startup and testing activities and troubleshooting prior to initiating full-scale (normal) operations. Startup and testing activities shall be in accordance with the Manufacturer's recommendations and as indicated in the Wastewater Treatment Work Plan. In addition, CONTRACTOR shall procure the services of the supplier/vendor of the treatment-related components of the overall system to assist in the performance of start-up activities at the Site and to provide instructions and training to CONTRACTOR related to operation, monitoring,

and maintenance of the system. All monitoring shall be conducted in accordance with the manufacturer's recommendations

- B. No discharge shall occur until the initial analytical results for the effluent sample have confirmed that the onsite pre-treatment system effluent contains non-detect concentrations of total PCBs and total mercury and meets the Discharge Permit requirements. The treated wastewater shall be held in a storage tank for sampling and analysis prior to being discharged.

3.3. OPERATION AND MONITORING

- A. CONTRACTOR shall operate and maintain the onsite pre-treatment system in accordance with the approved Wastewater Treatment Work Plan.
- B. CONTRACTOR shall provide for a trained system operator to be on Site at all times during operation and maintenance of the onsite pre-treatment system or conveyance system.
- C. CONTRACTOR shall perform all sampling and monitoring required by the Discharge Permit, which is anticipated to include the effluent monitoring identified in Table 02 73 00-A.

TABLE 02 73 00-A

PRE-TREATMENT SYSTEM EFFLUENT MONITORING REQUIREMENTS

Constituent	Effluent Limit	Sampling Frequency
Fat, Oil, Grease (FOG)	100 ppm ^A	5 days/week ^{B,C}
pH	6.5 to 9.5 ^A	Daily
Carbonaceous Biochemical Oxygen Demand (CBOD)	25 mg/L monthly 40 mg/L 7-day ^D	5 days/week ^{B,C}
Ammonia	^{D, E}	5 days/week ^{B,C}
Total Phosphorus	1.0 mg/L ^D	5 days/week ^{B,C}
Total Suspended Solids	30 mg/L monthly 45 mg/L 7-day ^D	5 days/week ^{B,C}
PCBs	Non-Detect ^F	Daily for first week then weekly thereafter ^F
Volatile Organic Compounds, Semi-Volatile Organic Compounds, and Synthetic Organic Contaminants	^{D, G}	Initial/Monthly ^C
Total Recoverable Phenolics	^{D, G}	Initial/Monthly ^C
Total Metals	^{D, G}	Initial/Monthly ^C
Total Mercury	Non-Detect ^F	Daily for first week then weekly thereafter ^F
Dissolved Oxygen	5.0 mg/L ^D	5 days/week ^D
Notes: ^A From City Of Manistique Sewer Ordinance. ^B Sampling frequency is for two weeks then reduce to 3 days per week. If stable, then once per week. ^C Based on correspondence with Corey Barr, WWTP Supt. ^D From Manistique WWTP NPDES Permit. ^E Reporting of 7-day average required, no effluent limit listed in Manistique WWTP NPDES permit. ^F Project-specific requirement. ^G No effluent limits given in Manistique WWTP NPDES permit; monitored annually at the Manistique WWTP for compliance.		

- D. CONTRACTOR shall discharge pre-treated effluent with non-detect concentrations of total PCBs and total mercury and that is in compliance at all times with the City of Manistique WWTP discharge permit requirements.
- E. CONTRACTOR shall minimize spills and leaks to the extent practicable from the onsite pre-treatment system or during transfer of wastewater to or from the onsite pre-treatment system.

Observed leaks in the onsite pre-treatment system or associated piping shall be addressed and remedied as soon as they are observed.

- F. Analytical reports for the wastewater samples shall immediately be provided by the CONTRACTOR's analytical laboratory to the PROFESSIONAL by e-mail upon receipt by the CONTRACTOR.
- G. Closely coordinate and monitor the system operations with respect to potential impacts and disruptions to the overall Project implementation and schedule. Under no circumstances will CONTRACTOR exceed the storage capacity of the influent and effluent storage tanks. Any determination regarding modifications to the discharge rate, method, and/or location shall be made between CONTRACTOR and PROFESSIONAL.
- H. Perform routine maintenance of the treatment system, as required, in accordance with the manufacturer's recommendations and the Wastewater Treatment Work Plan. During such times, CONTRACTOR shall coordinate these activities to minimize interruption to the overall Project implementation.

3.4. PRE-TREATED WASTEWATER TRANSPORT

- A. CONTRACTOR shall transport treated wastewater to the City of Manistique WWTP for disposal using the method described in the Wastewater Treatment Work Plan and approved by the PROFESSIONAL.
- B. CONTRACTOR shall transport or pump treated wastewater to the City of Manistique WWTP in a manner that will minimize spillage or leakage of treated wastewater.
- C. CONTRACTOR shall perform routine monitoring and maintenance of the conveyance system, if applicable, in accordance with the manufacturer's recommendations.
- D. CONTRACTOR shall complete the necessary field documentation required for the transportation and disposal of the treated water, in accordance with the Discharge Permit and local, state, and federal regulations.

3.5. CORRECTIVE ACTIONS

- A. At the direction of PROFESSIONAL, CONTRACTOR shall take corrective actions as necessary to maintain specified treatment system performance in the event of an upset condition and/or operating conditions that result in non-compliant effluent wastewater quality. During Corrective Actions, CONTRACTOR may be required to mobilize additional effluent storage tanks, treatment units or media, and/or repeat startup and testing procedures.
- B. CONTRACTOR shall make no claims for delays associated with maintenance, repairs, or documentation to correct performance of the onsite pre-treatment system and/or the associated onsite and offsite wastewater conveyance systems.
- C. CONTRACTOR shall contact the PROFESSIONAL immediately following discovery of problems with onsite pre-treatment system operations and provide immediate notification of major repairs necessary to maintain operation and compliance with the Discharge Permit.

3.6. DECOMMISSIONING

- A. Following completion of pre-treatment operations, the onsite pre-treatment system shall be decontaminated and decommissioned in accordance with the CONTRACTOR's Site Specific

Health and Safety Plan (Section 01 35 29), Wastewater Treatment Work Plan, and the vendor/supplier/manufacturer's recommendations.

- B. CONTRACTOR shall be responsible for the proper handling, transportation, and off-site disposal of wastes generated from treatment and any decontamination water that is created following decontamination of the onsite pre-treatment system.

3.7. FIELD QUALITY CONTROL

- A. CONTRACTOR shall, at all times, maintain the onsite pre-treatment system in compliance with the Discharge Permit and the design requirements established by the PROFESSIONAL.
- B. Materials and methods used in construction shall comply with relevant standards, as well as any other standards, codes, or specifications applicable to the design and construction of the onsite pre-treatment system.

3.8. ATTACHMENTS

- A. The documents listed below, and attached following this Section's "End of Section" designation, are part of this Specification Section.
 - 1. City of Manistique Industrial Discharge Contract Template (2 pages).

END OF SECTION

CONTRACT

Between

THE CITY OF MANISTIQUE
A Michigan Municipal Corporation

And

XXXXX, INC.

A xxxxx Corporation

xxxxxxxxxxxxxxxxx, Inc., desires to discharge treated industrial waste (Liquid) from a dredging operation of PCB contaminated soils from the Manistique River to the City of Manistique - Wastewater Treatment Plant, and the city of Manistique desires to accept this treated industrial waste at the wastewater treatment plant at 321 Trader's Point Drive, Manistique, and the parties agreeing that both parties benefit from entering into this contract,

THE PARTIES HEREBY AGREE AS FOLLOWS:

1. That with the approval of the appropriate state and federal agencies, and the Manistique city council; the City of Manistique will accept treated industrial waste from the xxxxxxxxxxxx.
2. xxxxxxxxxxxx, Inc., as owner/operator/contractor, will pay all costs related to delivery and treatment of the treated industrial waste by the City of Manistique, including but not limited to pumping, hauling, weighing, sampling, testing, and a fee per gallon of the treated industrial waste.
3. The cost for treatment will be \$.03 per gallon.
4. The City will base the gallons delivered from the tare and actual weight of the truck, with each gallon weighing 8.34 pounds. This fee will be adjusted based upon the City's expenses. **Or a Calibrated (Q) Flow Meter.**
5. The only location the City will receive the treated industrial waste will be at the wastewater treatment plant or **an authorized sanitary manhole**, 321 Trader's Point Drive, Manistique, Michigan.
6. Daily, all Q totals, samples & laboratory testing must be accompanied with approved paper work, to the Wastewater Treatment Plant at 321 Trader's Point Drive, Manistique.
7. The treated industrial waste will not in any way affect the wastewater plant operations in compliance to meet NPDES permit limits.
8. The City of Manistique reserves the right to discontinue accepting the treated industrial waste at any time.

9. The City of Manistique, through its water-wastewater superintendent or his or her designated agent, reserves the right to reject any industrial waste flow (Q). This may be based on an improper paper work, a pH test outside the acceptable range, or odors that are indicative of a flammable or explosive substance.

10. The sewer use ordinance of the City of Manistique, Ordinance No. 175 of 1978, shall be enforced.

11. The following sampling and testing of the leachate required by the City of Manistique and/or the State of Michigan are as follows:

A. A pH test will be performed **Daily** on all incoming industrial waste flows.

B. Testing for CBODs, ammonia, T. phosphorus, and suspended and total solids, will be performed based upon quantities (gallons received).

C. The City reserves the right to perform random split samples and collection of these samples. These tests can be done at the Manistique wastewater laboratory for a fee per sample less shipping costs to an outside laboratory.

D. Additional testing of the industrial waste will include metals, VOCs, SVOCs, SOCs (pesticides), PCBs, total recoverable phenolics, and FOG will be required. These samples will have to be sent to an outside laboratory, and xxxxxxx, Inc. shall be responsible for all costs.

13. City of Manistique reserves the right to add to, delete from, or otherwise modify this service agreement to ensure no operational or permit issue arises.

CITY OF MANISTIQUE

By: _____
Janet Jeffcott, Mayor

Date: _____

XXXXXXXXXXXXXXXXXX, INC.

By: _____
xxxxxxx, Its President

Date: _____

SECTION 31 05 15

FILL MATERIALS FOR EARTHWORK

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. Furnish all labor, materials, equipment, and services required to import, store (as necessary), and manage fill materials as shown and specified.
- B. Related Sections:
 - 1. Section 01 57 00, Temporary Controls.
 - 2. Section 31 20 00, Earth Moving.
 - 3. Section 31 25 00, Soil Erosion and Sedimentation Controls.
 - 4. Section 35 20 23, Dredging and Cover.

1.2. REFERENCES

- A. Standards referenced in this Section are:
 - 1. ASTM D422, Test Method for Particle-Size Analysis of Soils.
 - 2. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
 - 3. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.
 - 4. MDOT Manual for the Michigan Test Methods (MTMs), latest edition.

1.3. QUALITY ASSURANCE

- A. Qualifications:
 - 1. CONTRACTOR's Testing Laboratory:
 - a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials specified in this Section.
 - b. Testing laboratory shall comply with ASTM E329 and requirements of this Section.
 - c. Testing laboratory shall be experienced in the types of testing required.
 - d. Selection of testing laboratory is subject to PROFESSIONAL's acceptance.
- B. Quality Assurance Testing:
 - 1. Quality assurance testing is in addition to field quality control testing required by the Contract Documents.
 - 2. Materials used in the Work may require testing and retesting, as directed by PROFESSIONAL, during the Project. Allow free access to material stockpiles and facilities at all times. Retesting of rejected materials and installed Work shall be performed at CONTRACTOR's expense.
 - 3. CONTRACTOR's Testing Laboratory Scope:
 - a. Collect samples and perform testing of proposed fill materials in the laboratory to demonstrate compliance of the Work with the Contract Documents.
 - b. Testing laboratory shall perform testing required to obtain data for selecting moisture content for placing and compacting fill materials.
 - c. Submit to PROFESSIONAL and CONTRACTOR written report results of each test.
 - 4. Required Quality Assurance Material Testing by CONTRACTOR's Testing Laboratory:

- a. Gradation in accordance with ASTM D422. Perform one test for every 1,000 cubic yards of each type of material incorporated into the Work.
- b. Analytical testing of cover fill performed at a minimum frequency of one test for every source and in accordance with the following:
 - 1) Samples shall be analyzed by an Environmental Laboratory Approval Program- (ELAP-) certified laboratory for volatile organic compounds (VOCs), semivolatile organic compounds (SVOC), polychlorinated biphenyls, pesticides/herbicides, and metals.
 - 2) Costs associated with testing will be the responsibility of CONTRACTOR. PROFESSIONAL reserves the right to request further sampling if concern arises that the characteristics of the materials have changed.

1.4. SUBMITTALS

- A. Qualifications Statements:
 1. Quality Assurance Testing Laboratory: Seven business days prior to the start of the work, submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance testing required in this Section.
- B. Quality Assurance Test Results Submittals:
 1. Seven business days prior to the start of the Work, submit results of quality assurance testing performed by in accordance with Paragraph 1.3.B of this Section, unless included as part of another submittal under this Section. Submit results for the following quality assurance testing:
 - a. Gradation test results on borrow fill material.
 - b. Analytical laboratory results for Cover Fill showing material is "clean" as defined by Paragraph 1.4.C.3.
- C. Product Data: Seven business days prior to the start of the Work, submit the following:
 1. Supplier certifications that the proposed fill materials meet the requirements specified in this Section. The source of the fill material shall be subject to approval of the OWNER.
 2. Supplier's proposed source of fill materials.
 3. Written certification from Supplier and CONTRACTOR that all fill materials brought to the Site have been obtained from a "clean" source that is not known or suspected to be contaminated. Clean in this context shall mean:
 - a. No concentrations of PCBs above 1 parts per million (ppm) as defined by TSCA, Subpart D Cleanup Standards and Michigan Department of Environmental Quality (MDEQ) Part 201 Risk Based Screening Levels for Residential Criteria.
 - b. No concentrations of Michigan 10 Metals above the Residential and Commercial I Drinking Water Protection Criteria and Groundwater Interface Criteria, whichever criterion is most restrictive, as defined in the MDEQ, Revised Part 201 Operational Memorandum No. 1 Cleanup Criteria Tables, dated January 2006, or as amended.
 - c. No concentrations of VOCs or SVOCs above MDEQ Operational Memorandum No. 2 detection limits dated October 2004, or as amended.

1.5. STORAGE AND PROTECTION

- A. Fill materials shall be stored in locations so as not to endanger the Work, and so that easy access may be had at all times to all parts of the Work. Locate and retain soil materials away from edge of excavations.
- B. Special precautions shall be taken to permit access at all times to fire hydrants, fire alarm boxes, driveways, and other points where access may involve the safety and welfare of the general public.

C. Temporary Stockpiles

1. Stockpiles shall be kept neatly piled and trimmed
2. Stockpiles shall be securely covered at all times (during both working and non-working hours) with polyethylene liners when not in use. Liners shall be properly anchored to prevent uplift due to wind conditions and shall be installed to minimize the ponding of precipitation.
3. Based on site conditions, the PROFESSIONAL may elect to limit the maximum allowable stockpile size. Limitations to stockpile size shall not result in any additional cost to the OWNER.
4. Stockpiles shall be inspected daily (at a minimum) and any noted deficiencies shall be immediately corrected by CONTRACTOR to the satisfaction of the OWNER.

PART 2 PRODUCTS

2.1. MATERIALS

A. General Fill:

1. Material shall be free of rock and gravel larger than 3 inches in any dimension, debris, waste, frozen materials, organic material, and other deleterious matter.
2. Material shall have a liquid limit not greater than 45, and plasticity index not greater than 25.
3. Previously-excavated and uncontaminated materials complying with this Section may be used for general fill.
4. When on-Site materials are found unsuitable for use as general fill, provide approved off-Site general fill materials. Prior to using off-Site material as general fill, furnish submittal for and obtain PROFESSIONAL's approval of the material proposed for use.

B. Cover Fill:

1. Material shall be fine, clean, hard, durable, uncoated particles of sand free from organic material, clay lumps, and soft or flaky granular material resulting from the natural disintegration of rock.
2. Material shall meet all requirements of a MDOT 2NS Fine Aggregate and have the following gradation by weight:

<u>Sieve</u>	<u>Percent Passing</u>
¾ in	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
No. 200	0-3.0

C. Gravel:

1. Material shall be thoroughly washed clean, sound, tough, hard crushed or uncrushed stone or approved equal free from coatings, organic material, clay lumps, and soft or flaky granular material resulting from the natural disintegration of rock.
2. Material shall meet all requirements of a MDOT Coarse Aggregate 6A or 6AA, including the following gradation:

<u>Sieve</u>	<u>Percent Passing</u>
1 ½ inch	100
1 inch	95-100
½ inch	30-60
No. 4	0-8
No. 200	0-1.0

2.2. SOURCE QUALITY CONTROL

- A. Perform quality assurance testing, and submit results to PROFESSIONAL, in accordance with the 'Quality Assurance' Article in Part 1 of this Section.

PART 3 EXECUTION

3.1. GENERAL

- A. Fill materials will be placed and installed in accordance with the Drawings and the applicable Contract Documents.
- B. Materials displaced through the use of the above materials will be disposed of in accordance with Section 02 61 10, Handling and Disposal of Impacted Material.

END OF SECTION

SECTION 31 05 19

GEOSYNTHETICS FOR EARTHWORK

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. Furnish all labor, tools, materials, equipment, and services required to supply, install, and dispose of the geosynthetics as specified herein and as shown on the Drawings.
- B. Related Sections:
 - 1. Section 01 11 00, Summary of Work.
 - 2. Section 01 33 00, Submittal Procedures.
 - 3. Section 01 55 13, Access Roads and Staging Areas.
 - 4. Section 31 05 15, Fill Materials for Earthwork.
 - 5. Section 31 20 00, Earth Moving.

1.2. TERMINOLOGY

- A. For these Technical Specifications and the Drawings, the term "geosynthetics" is used to encompass both geotextile and geomembrane materials.

1.3. REFERENCES

- A. Arcadis. 2016. Operable Unit 1: Final Design Report. Manistique Area of Concern, Schoolcraft County, Michigan. April.
- B. American Society for Testing and Materials International (ASTM):
 - 1. ASTM D638, Standard Test Method for Tensile Properties of Plastics.
 - 2. D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
 - 3. ASTM D1004, Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 - 4. ASTM D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - 5. ASTM D4355-99 Standard Test Method for Deterioration of Geotextiles.
 - 6. ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - 7. ASTM D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 8. ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 9. ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - 10. ASTM D4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 - 11. ASTM D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
 - 12. ASTM D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
 - 13. ASTM D6241, Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using 50-mm Probe.
 - 14. ASTM D6693, Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

1.4. QUALIFICATIONS

A. CONTRACTOR:

1. CONTRACTOR shall agree to participate in and conform to all items and requirements of the quality assurance program as outlined in this Specification, and in the Contract Documents.
2. Geosynthetics Installer, if required, will be contracted directly by CONTRACTOR. Geosynthetics Installer shall meet the qualification requirements of this Specification.
3. CONTRACTOR shall be responsible for the installation of geosynthetics, for panel layout, seaming, patching, testing, repairs, and all other activities of the geosynthetic material, as required.

B. Manufacturer:

1. The manufacturer of the specified geosynthetics or similar product will have at least 3 years of continuous experience in the manufacturing of such materials.
2. The manufacturer shall have sufficient production capacity and qualified personnel to meet the demands (e.g., quantity production and quality control) of this Project.

C. Installer:

1. Installation of the specified geosynthetic materials shall be conducted an installer trained and licensed for the installation of the specified geosynthetic material.
2. The geosynthetic material installer will have at least 3 years of experience in the installation of the specified geosynthetic material or similar.
3. All seaming, patching, other welding operations, and field testing will be performed by qualified technicians employed by the geosynthetic material installer.

1.5. SUBMITTALS

- A. Submit the manufacturer's data and specifications for all geosynthetic material including, at a minimum, physical properties of materials, dimensions, packaging, storage, handling, and installation techniques for each required application, for review by the PROFESSIONAL at least 2 weeks prior to planned use.

1.6. STORAGE AND PROTECTION

- A. Each roll of geosynthetic delivered to the Site shall be labeled by the manufacturer identifying the manufacturer's name, product identification, lot number, roll number and roll dimensions. The integrity and legibility of labels shall be preserved during storage.
- B. All rolls and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify the PROFESSIONAL if any loss or damage exists to geosynthetic. Replace loss and repair damage to new condition, in accordance with manufacturer's instructions and at no additional cost to the OWNER.
- C. Geosynthetic shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. Geosynthetic rolls shall be shipped and stored in relatively opaque and watertight wrappings, at the leveled, dry, and well drained areas, away from high traffic.
- D. CONTRACTOR shall be responsible for all costs of warranty repair work, including removal, shipping, and reinstallation of geosynthetics during the warranty period.

PART 2 PRODUCTS

2.1. NON-WOVEN GEOTEXTILE FABRICS

- A. Geotextile shall be a needle punched, nonwoven fabric composed of 100 percent polypropylene filaments, which are formed into a stable network such that the filaments retain their relative position. The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalizes, and acids.
- B. Non-woven geotextile shall be 16-oz non-woven geotextile. 16-oz non-woven geotextile shall conform to the following:

Material Property	Test Method	Test Frequency	Minimum Average Roll Value
Grab Tensile Strength	ASTM D4632	1 per type	370 lb
Trapezoid Tear Strength	ASTM D4533	1 per type	145 lb
CBR Puncture Strength	ASTM D6241	1 per type	900 lb
UV Resistance	ASTM D7238	1 per type	70% Strength retained at 500 hours

2.2. WOVEN GEOTEXTILE FABRIC

- A. Geotextile shall be a woven fabric composed of 100 percent polypropylene filaments, which are formed into a stable network such that the filaments retain their relative position. The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalizes, and acids.
- B. Woven geotextile shall conform to the following:

Material Property	Test Method	Test Frequency	Minimum Average Roll Value
Grab Tensile Strength	ASTM D4632	1 per type	200 lb
Grab Tensile Elongation	ASTM D4632	1 per type	MD - 15% CD - 10%
Trapezoid Tear Strength	ASTM D4533	1 per type	75 lb
CBR Puncture Strength	ASTM D6241	1 per type	700 lb
Apparent Opening Size	ASTM D4751	1 per type	40 U.S. Sieve
Permittivity	ASTM D4491	1 per type	0.05 sec ⁻¹
Water Flow Rate	ASTM D4491	1 per type	4 gal/min/ft ²

2.3. GEOMEMBRANE

- A. Geomembrane for shall be a linear low-density polyethylene (LLDPE) impermeable liner. The geomembrane shall be inert to biological degradation and naturally encountered chemicals, alkalizes, and acids.
- B. LLDPE geomembrane shall conform to the following:

Material Property	Test Method	Test Frequency	Minimum Average Roll Value
Thickness	ASTM D5199	1 per type	40 mil
Density	ASTM D1505	1 per type	0.939 g/cm ³
Tensile Strength (Break)	ASTM D6693	1 per type	152 lb/in -width
Tensile Elongation (Break)	ASTM D6693	1 per type	800%

Tear Resistance	ASTM D1004	1 per type	22 lb
Puncture Resistance	ASTM D4833	1 per type	72 lb

PART 3 EXECUTION

3.1. INSPECTION

- A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the PROFESSIONAL, in writing, of conditions detrimental to the property and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.
- B. PROFESSIONAL may randomly inspect geotextiles before or during installation.
- C. CONTRACTOR shall visually inspect the geotextile and geomembrane during deployment for imperfections and mark faulty or suspect areas.
- D. CONTRACTOR shall inspect geotextiles exposed to sunlight at the Site once every 15 days. If damage is discovered, CONTRACTOR shall repair per Section 3.4 or replace geotextiles, as needed.

3.2. SURFACE PREPARATION

- A. Prior to installing the geosynthetic, placement surfaces shall be leveled, uniformly compacted, and free of deleterious material (e.g., sharp stones, woody debris, construction debris) that could damage the material, as necessary, to provide a stable interface for the geosynthetic that is as smooth as possible.

3.3. NON-WOVEN AND WOVEN GEOTEXTILE INSTALLATION

- A. CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.
- B. Proper cutting tools will be used to cut and size the geotextile materials. Extreme care will be taken while cutting the geotextile.
- C. Geotextile shall not be exposed to precipitation prior to being installed, and shall not be exposed to direct sunlight for more than 15 days.
- D. Geotextile shall be overlapped as recommended by the manufacturer.
- E. Equipment will not be driven directly on the geotextile.

3.4. NON-WOVEN AND WOVEN GEOTEXTILE REPAIR:

- A. Any holes or tears in the geotextile shall be repaired as follows:
 - 1. On slopes: A fabric patch shall be sewn into place using a double sewn lock stitch (1/4-inch to 3/4-inch apart and no closer than 1-inch from any edge). Should any tear exceed ten percent of the width of the roll, that roll shall be removed from the slope and replaced.
 - 2. Non-slopes: A fabric patch shall be spot-seamed in place with a minimum of 24-inches of overlap in all directions.

3.5. GEOMEMBRANE INSTALLATION

- A. Geomembrane panels shall be placed one at a time, and each panel shall be seamed to adjacent panels the same day of placement
- B. Geomembrane shall not be placed when ambient temperature is below 32° F, unless otherwise authorized by the PROFESSIONAL.
- C. Geomembrane shall not be placed during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of winds exceeding 20 miles per hour.
- D. The following placement methods shall be employed:
 - 1. No vehicular traffic shall be allowed on the geomembrane
 - 2. Equipment shall not damage the geomembrane by handling, trafficking, leakage of hydrocarbons, or other means.
 - 3. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane.
 - 4. The method used to unroll the panels shall not scratch or crimp the geomembrane and shall not damage the supporting soil.
 - 5. The prepared surface underlying the geomembrane shall not be allowed to deteriorate after acceptance of the surface, and shall remain acceptable up to the time of geomembrane placement.
 - 6. The method used to place the panels shall minimize wrinkles.
 - 7. Temporary loads and/or anchors not likely to damage the geomembrane may be placed on the geomembrane to prevent uplift by wind.
 - 8. Any panel or portion thereof that becomes seriously damaged shall be replaced with new material at no additional cost to the OWNER. Less serious damage may be repaired at the PROFESSIONAL's discretion. Damaged panels or portions of damaged panels that have been rejected shall be removed from the site.
- E. In general, seams shall be oriented parallel to the line of maximum slope. In corners and odd-shaped geometric locations, the number of seams shall be minimized. No horizontal seam shall be made within 5 feet of any toe of the slope, except where approved by the PROFESSIONAL.
- F. Approved processes for seaming are extrusion welding and fusion welding.
- G. Geomembrane panels shall be overlapped a minimum of three (3) inches for extrusion welding and five (5) inches for fusion welding
- H. Seams shall be constructed in accordance with the following:
 - 1. Prior to seaming, the seam area shall be cleaned and made free of moisture, dust, dirt, debris of any kind, and foreign material
 - 2. If seam overlap grinding is required, the process shall be completed according to the Manufacturer's instructions within one hour of the seaming operation in a manner that does not damage the geomembrane.
 - 3. Seaming shall extend to the outside edge of panels
 - 4. If required, a firm substrate shall be provided by using a flat board, a conveyor belt, or similar hard surface, directly beneath the seam overlap to achieve proper support.
 - 5. Where fishmouths occur, the material will be cut, overlapped, and an overlap weld will be applied.
 - 6. Seaming equipment shall be operated in a manner that does not cause damage to the geomembrane, only apparatus that the PROFESSIONAL has approved by make and model shall be used.

3.6. GEOMEMBRANE REPAIR:

- A. All seams and non-seam areas of the geomembrane shall be examined by the PROFESSIONAL for evidence of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed if surface contamination inhibits examination.
- B. Each suspect location shall be nondestructively tested using approved methods. Each location which fails shall be marked by the PROFESSIONAL and repaired.
- C. Geomembrane repair procedures include:
 - 1. Patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter
 - 2. Abrading and re-seaming, used to repair small sections of extruded seams
 - 3. Spot seaming, used to repair small tears, pinholes, or other minor localized flaws.
 - 4. Capping, used to repair long lengths of failed seams
 - 5. Removing bad seam and replacing with a strip of new material seamed into place.
- D. All surfaces must be clean and dry at the time of repair.
- E. Each repair shall be numbered, logged, and nondestructively tested using approved methods.

3.7. PLACEMENT OF MATERIALS OVER GEOSYNTHETIC

- A. CONTRACTOR shall place all materials over the geosynthetic in such a manner to ensure the geosynthetic is not damaged; minimal slippage of the geosynthetic on underlying layers; and no excess tensile stresses in the geosynthetic.
- B. No granular materials shall be placed directly over the geomembrane at any time. A non-woven geotextile cushion shall be installed between aggregate and geomembrane.

3.8. FIELD QUALITY CONTROL

- A. Geomembrane Nondestructive Seam Continuity Testing
 - 1. CONTRACTOR shall nondestructively test all field seams over their full length using a vacuum test, air pressure test (for double fusion seams only), or other approved method. Continuity testing shall be carried out as the seaming work progresses, not at the completion of all field seaming.
 - 2. CONTRACTOR shall complete any required repairs in accordance with Paragraph 3.6 of this Section.
 - 3. The following procedures shall apply to locations where seams cannot be destructively tested:
 - a. If the seam is accessible to testing equipment prior to a final installation, the seam shall be nondestructively tested prior to final installation
 - b. If the seam cannot be tested prior to final installation, the seaming operations must be observed in their entirety by the PROFESSIONAL for uniformity and completeness.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform clearing and grubbing as shown and specified in the Contract Documents.
 - 2. The Work includes removing from the Site and disposing of trees, stumps, brush, roots, shrubs, vegetation, logs, rubbish, and other objectionable material.
 - 3. Pay all costs associated with transporting and disposing of debris resulting from clearing.
 - 4. Limits of Clearing and Grubbing Work: Clear and grub all areas within the Work areas unless otherwise shown or indicated in the Contract Documents.
- B. Related Sections:
 - 1. Section 01 57 00, Temporary Controls.
 - 2. Section 32 60 00, Site Restoration.

1.2. WARRANTY

- A. CONTRACTOR shall warrant that Work performed under this Section will not permanently damage trees, shrubs, turf, and plants designated to remain, or other adjacent work, facilities, or property. If damage resulting from CONTRACTOR's operations becomes evident during the correction period, CONTRACTOR shall replace damaged items and property at no additional cost to OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. PREPARATION

- A. Protection:
 - 1. Throughout the Project, protect existing site improvements, including streets, drives, and Underground Facilities to remain (if any), and adjacent property and structures. Repair damage caused by CONTRACTOR to original condition or replace in kind, to satisfaction of PROFESSIONAL, at no additional cost to OWNER.
 - 2. Protect trees, shrubs, vegetation, and grassed areas to remain by providing temporary fencing, barricades, wrapping, or other methods shown, specified, or accepted by PROFESSIONAL. Correct at CONTRACTOR's expense damage caused by CONTRACTOR outside the limits of clearing Work.
 - 3. Do not remove trees without approval of PROFESSIONAL, unless shown or indicated for removal.
 - 4. Do not locate construction equipment, stored materials, or stockpiles within drip line of trees and vegetation to remain.
- B. Site Preparation:
 - 1. Obtain, pay costs associated with, and comply with applicable permits required for clearing and grubbing Work.
 - 2. Delineation of Clearing and Grubbing Limits:

- a. Locate and clearly flag trees and vegetation to remain, and other materials to remain in the clearing and grubbing limits. Locate and clearly flag salvable vegetation to be relocated.
 - b. Provide flagging to delineate limits of areas to be cleared or grubbed. Review at Site with PROFESSIONAL before commencing removal of trees, vegetation, and other materials to be removed.
 - c. Replace flagging that is lost, removed, or destroyed, until clearing and grubbing Work is complete and PROFESSIONAL allows removal of flagging.
3. Erosion and Sediment Controls:
- a. Provide applicable erosion and sediment controls before commencing clearing and grubbing Work.
 - b. Comply with erosion and sediment control requirements of Section 01 57 00, Temporary Controls.
 - c. Continue providing erosion and sediment controls as clearing and grubbing Work progresses to previously uncleared, ungrubbed areas of the Site.

3.2. CLEARING AND GRUBBING

- A. Remove and dispose of all trees, shrubs, stumps, roots, brush, logs, rubbish, and debris within limits of clearing and grubbing shown or indicated in the Contract Documents, unless otherwise shown or indicated.
- B. Trees and Shrubs Improperly Destroyed or Damaged:
1. For each tree or shrub to remain that is destroyed or damaged beyond repair by CONTRACTOR, provide two replacements of the same species at locations to be designated by PROFESSIONAL.
- C. Trees and shrubs to remain that have been damaged or require trimming shall be treated and repaired under the direction of a qualified arborist, or other professional with qualifications acceptable to PROFESSIONAL. Trees and shrubs intended to remain, that are damaged beyond repair or that are removed, shall be replaced by CONTRACTOR at no additional cost to OWNER.
- D. Salvable Vegetation:
1. Trees, shrubs, and other vegetation requiring removal to facilitate the Work, and that will be transplanted elsewhere at the Site, shall be carefully balled and burlapped or placed in temporary pots, and stored at the Site in an acceptable area. Work involving removing and relocating trees, shrubs, and other vegetation shall be under the direction of qualified arborist acceptable to PROFESSIONAL, or other professional acceptable to PROFESSIONAL, hired by CONTRACTOR.
- E. Disposal of Cleared and Grubbed Materials:
1. Dispose at appropriate off-Site location trees, stumps, rubbish, debris, and other cleared and grubbed material. Cleared or grubbed materials may remain at the Site only when allowed in the Contract Documents or when approved by PROFESSIONAL in writing. Do not use cleared or grubbed material as fill, backfill, or in embankments.
 2. Dispose of cleared and grubbed material in accordance with Laws and Regulations.
 3. Do not burn clearing debris at the Site, unless approved by OWNER and authorities having jurisdiction. If burning is permitted, comply with requirements of authorities having jurisdiction and Laws and Regulations. If burning is permitted at the Site, also comply with OWNER's requirements.

3.3. TOPSOIL REMOVAL

- A. Existing topsoil to be removed is defined as friable, clay loam, surface soil present in depth of at least four inches. Topsoil shall be free of subsoil, clay lumps, stones, and other objects over two-inch diameter and other objectionable material.
- B. Stripping:
 - 1. Strip topsoil to depths encountered, in manner that prevents intermingling of topsoil with underlying subsoil or other objectionable material. Remove heavy growths of grass and vegetation from areas before stripping.
 - 2. Do not strip topsoil from within drip line of each tree to remain as part of the completed Project.
- C. Stockpile topsoil in storage stockpiles in areas shown, or where otherwise accepted by PROFESSIONAL. Construct storage piles so that surface water drains freely. Stabilize large topsoil piles with a cover crop and mulch, and provide silt fencing around perimeter of pile to prevent topsoil erosion and sedimentation; silt fencing shall be in accordance with Section 01 57 00, Temporary Controls. Cover smaller topsoil stockpiles, when used, with reinforced fabric to prevent windblown dust. Properly dispose of excess topsoil at a location other than the Site.

3.4. RESTORATION

- A. Cleared areas shall be restored in accordance with the Drawings and Section 32 60 00, Site Restoration.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to perform all excavating, filling, and grading, and disposing of earth materials as shown, specified, and required for construction of roads and other facilities required to complete the Work.
 - 2. Preparation of subgrade for facilities is included under this Section.
 - 3. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.
- B. Related Sections:
 - 1. Section 01 56 00, Temporary Barriers.
 - 2. Section 01 57 00, Temporary Controls
 - 3. Section 02 61 10, Handling and Disposal of Impacted Material
 - 4. Section 02 73 00, Wastewater Handling and Disposal.
 - 5. Section 31 05 15, Fill Materials for Earthwork.
 - 6. Section 31 05 19, Geosynthetics for Earthwork.
 - 7. Section 31 25 00, Soil Erosion and Sedimentation Controls.
 - 8. Section 32 60 00, Site Restoration.

1.2. REFERENCES

- A. Standards referenced in this Section are:
 - 1. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.
 - 2. MDOT Manual for the Michigan Test Methods (MTMs), latest edition.

1.3. TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
 - 1. "Subgrade" is the uppermost surface of native soil material unmoved from cuts; the bottom of excavation.

1.4. QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Perform excavation work in compliance with requirements of authorities having jurisdiction and Laws and Regulations, including: OSHA, 29 CFR Part 1926, Section .650 (Subpart P – Excavations).
 - 2. Obtain required permits and approvals for excavation and fill Work, including work permits from right-of-way owners and permits from environmental authorities having jurisdiction over discharge of water from excavations.

1.5. SITE CONDITIONS

- A. Subsurface Information: Section 00210, Information to Bidders, indicates information available relative to subsurface conditions at the Site. Such information and data are not intended as a representation or warranty of continuity of conditions between soil borings or test pits, nor of groundwater levels at dates and times other than date and time when measured, nor that purpose of obtaining the information and data were appropriate for use by CONTRACTOR. OWNER will not be responsible for interpretations or conclusions drawn therefrom by CONTRACTOR.
- B. Soil borings and other exploratory operations may be made by CONTRACTOR, at no additional cost to OWNER. Coordinate CONTRACTOR-performed test borings and other exploratory operations with OWNER and utility owners as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of OWNER or utility owners. Comply with Laws and Regulations relative to required notifications.
- C. Existing Structures:
 - 1. The Contract Documents show or indicate certain structures and underground facilities adjacent to the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. CONTRACTOR shall explore ahead of the excavation to determine the exact location of all existing structures and Underground Facilities. Existing structures and underground facilities shall be supported and protected from damage by CONTRACTOR. Immediately repair and restore existing structures and underground facilities damaged by CONTRACTOR without additional cost to OWNER.
 - 2. Movement or operation of construction equipment over underground facilities shall be at CONTRACTOR's sole risk and only after CONTRACTOR has prepared and submitted to PROFESSIONAL and utility owners (as applicable), and received acceptance therefrom, a plan describing CONTRACTOR's analysis of the loads to be imparted and CONTRACTOR's proposed measures to protect structures and underground facilities during the Project.
 - 3. Coordinate with utility owners for shut-off of services in active piping, conduits, and overhead lines. When required by utility owner, OWNER will assist CONTRACTOR with utility owner notifications. Completely remove buried piping and conduits indicated for removal and not otherwise indicated as being abandoned or to remain in place.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Refer to Section 31 05 15, Fill Materials for Earthwork, for details on fill material requirements.

PART 3 EXECUTION

3.1. INSPECTION

- A. Provide PROFESSIONAL with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. PROFESSIONAL will advise CONTRACTOR in writing when PROFESSIONAL is aware of conditions that may be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2. PREPARATION

- A. Site Preparation:
 - 1. Clear areas to be occupied by permanent construction of all trees, brush, roots, stumps, logs, wood and other materials, and debris. Clean and strip vegetation, sod, topsoil, and

organic matter from subgrades where fills will be placed, and from areas where structures will be constructed. Remove from the Site and properly dispose all waste materials.

2. Burning is not allowed at the Site.

B. Explosives: Use of explosives is not allowed.

C. Maintain and protect traffic in accordance with Section 01 57 00, Temporary Controls.

3.3. DEWATERING

A. General:

1. Provide and maintain adequate drainage and dewatering equipment to remove and dispose all surface water and groundwater entering work areas. Keep each work areas dry during earthwork activities.
2. Keep all working areas at the Site free of surface water at all times. Provide temporary drainage ditches and temporary dikes, and provide required temporary pumping and other work necessary for diverting or removing rainfall and all other accumulations of surface water from upland work areas. Perform diversion and removal of surface water in manner that prevents accumulation of water behind permanent or temporary structures and at any other locations in the construction area where such accumulations may be detrimental.
3. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the surface water or groundwater downstream of the point of discharge, shall not be discharged. Such waters shall be managed in accordance with Section 02 73 00, Wastewater Handling and Disposal.
4. CONTRACTOR shall be responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.

3.4. EXCAVATION

A. Perform excavation required to complete the Work as shown, specified, and required. Excavations shall include removing and handling of earth, sand, clay, gravel, hardpan, soft, weathered or decomposed rock, pavements, rubbish, and other materials within the work areas, including upland support area(s).

B. Excavation Protection:

1. Provide excavation protection system(s) in accordance with Laws and Regulations to prevent injury to persons and property, including Underground Facilities.
2. Excavation Less Than 5 Feet Deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
3. Excavations Greater Than 5 Feet Deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced.
4. Maintain excavations in dry condition in accordance with "Dewatering" Article in Part 3 of this Section.

C. Subgrades – General:

1. Subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with drainage material meeting the requirements as specified in this Section. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown.
2. If, in PROFESSIONAL's opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within CONTRACTOR's

control, subgrade shall be excavated to firm material, trimmed, and backfilled with select fill material at CONTRACTOR's expense.

3.5. UNAUTHORIZED EXCAVATION

- A. All excavations outside lines and grades shown or indicated and that are not approved by PROFESSIONAL, together with removing and disposing the associated material, shall be at CONTRACTOR's expense. Unauthorized excavations shall be filled with properly-compacted select fill material at CONTRACTOR's expense.

3.6. SOIL EROSION AND SEDIMENTATION CONTROLS

- A. Provide temporary soil erosion and sedimentation controls (SESC) in accordance with the approved SESC implementation plan approved by authorities having jurisdiction and as required by Section 31 25 00, Soil Erosion and Sedimentation Controls.

3.7. FILL AND COMPACTION – GENERAL PROVISIONS

- A. Provide and compact all fill required as shown and as specified in this Section and the Drawings. CONTRACTOR shall be responsible for determining the volume of fill to be imported from off-site and will not be paid for quantities greater than those necessary to complete required earth work. CONTRACTOR shall pay for all labor, equipment, supplies, transports and disposal of quantities of select fill brought to the site in excess of those required to complete earth work activities.
- B. Placement – General:
 - 1. Place fill as required to restore grades to pre-construction conditions.
 - 2. For upland areas to be restored with seeding and mulch, fill within 4 inches of final grade shall be topsoil as required by Section 32 60 00, Site Restoration.
 - 3. Place fill materials in horizontal, loose lifts, not exceeding 1 foot uncompacted thickness. Place fill in a manner ensuring uniform lift thickness after placing. Mechanically compact each lift, by not less than three complete coverages of the compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface. Compaction of fill materials by inundation with water is unacceptable.
 - 4. Do not place fill materials when standing water is present on surface of the area where fill will be placed. Do not compact fill when standing water is present on the fill to be compacted. Do not place or compact fill in a frozen condition or on top of frozen material. Fill containing organic materials or other unacceptable material previously described shall be removed and replaced prior to compaction.
 - 5. Repair, at CONTRACTOR's expense, observed or measured settlement. Make repairs and replacements as required within 30 days after being so advised by PROFESSIONAL.
- C. Replacement of Unacceptable Excavated Materials: In cases where over- excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with general fill material and thoroughly compact in accordance with this Section.

3.8. DISPOSAL OF EXCAVATED MATERIALS

- A. General:
 - 1. CONTRACTOR shall haul away material removed from excavations that does not comply with requirements for fill, or is in excess of the quantity required for fill.
 - 2. Disposal of excavated materials shall be in compliance with all regulations and as required by Section 02 61 10, Handling and Disposal of Impacted Material.

3.9. TEMPORARY BARRIERS

- A. Provide temporary barriers in accordance with Section 01 56 00, Temporary Barriers and Enclosures, surrounding excavations and excavation work areas to provide temporary protection to persons and property. Barrier shall have openings only at vehicular, equipment, and worker access points.

END OF SECTION

SECTION 31 25 00

SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1. DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to construct, maintain, and remove temporary soil erosion and sedimentation controls to address environmental conditions at the Site and adjacent areas during construction.
 - a. Maintain temporary controls until no longer required.
 - b. Temporary controls include, but are not limited to, the following:
 - 1) Soil erosion and sedimentation controls (SESC).
 - 2) Noise controls.
 - 3) Dust control.
 - 4) Control of water, including stormwater runoff.
 - 5) Pollution control.
2. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to construct permanent soil erosion and sedimentation controls to address environmental conditions at the Site and adjacent areas following construction.
 - a. Permanent controls include, but are not limited to, the following:
 - 1) Grass seeding and mulch matting as shown and specified.

B. Related Sections:

1. Section 00100 (Instruction to Bidders), Article 17, Soil Erosion and Sedimentation Control – Fine for Non-Compliance.
2. Section 01 35 13, Special Project Procedures
3. Section 01 57 00, Temporary Controls.
4. Section 02 73 00, Wastewater Handling and Disposal.
5. Section 31 05 15, Fill Materials for Earthwork.
6. Section 31 05 19, Geosynthetics for Earthwork.
7. Section 31 10 00, Site Clearing.
8. Section 32 60 00, Site Restoration.

1.2. QUALITY ASSURANCE

A. Regulatory Requirements:

1. All work under this Contract shall meet the stormwater management requirements of the Project and comply with the applicable Soil Erosion and Sedimentation Control (SESC) rules and regulations (Soil Erosion and Sedimentation Control – 1994 PA 451, Part 91, as amended, MCL 324.9101 et seq.) and specific provisions and regulations for same within the Contract Documents.
 - a. The Department of Technology, Management, and Budget (DTMB), Facilities Administration, Design, and Construction Division, an Authorized Public Agency (APA), has promulgated standard procedures and specifications for SESC measures that shall be considered a part of the Contract Documents.
 - b. DTMB is the primary APA for SESC permitting regarding this project, and may choose to delegate to the local level APA, hereby collectively defined as the PERMITTING AUTHORITY. The CONTRACTOR will be notified in writing if the PERMITTING AUTHORITY is delegated to the local level by DTMB.
 - c. CONTRACTOR shall submit an application and obtain the SESC permit from the PERMITTING AUTHORITY.

- d. SESC measures will be monitored and enforced by Facilities Administration, Design, and Construction Division or the PERMITTING AUTHORITY through the review of the CONTRACTOR's implementation plans and Site inspections.
 - e. DTMB, PERMITTING AUTHORITY, or the PROFESSIONAL will notify CONTRACTOR in writing of any violation(s) of the applicable SESC statutes and/or the corrective action(s) undertaken by the OWNER and may issue stop work orders.
 - f. DTMB or PERMITTING AUTHORITY has the right to assess a fine to CONTRACTOR for noncompliance with the provisions of the Contract Documents and/or SESC regulations applicable to this work and fines shall be in addition to any other remediation costs or liquidated damages applicable to the project and may exceed the value of the Contract.
 - g. DTMB or PERMITTING AUTHORITY may impose fines of at least \$500 per day and assess actual damage costs if CONTRACTOR refuses to comply with the SESC requirements and corrective measures contained in the construction contract.
 - h. CONTRACTOR shall pay for all SESC Permit Application Fees, Inspection Fees, Bonds, and Escrows as required by the PERMITTING AUTHORITY.
2. CONTRACTOR shall comply with the following requirements from the Professional Services CONTRACTOR SESC Plan Supplemental Guidance, issued October 4, 2007, and the requirements of the PERMITTING AUTHORITY.
- a. All earth changes of one acre or more or within 500 feet of Waters of the State require a SESC permit. If a SESC permit is required, the professional services contractor (design consultant) shall prepare an SESC plan. The SESC plan shall address both wind and water erosion and sedimentation.
 - b. CONTRACTOR shall review the design consultant's SESC plan in order to prepare and issue for approval an "SESC Implementation Plan", which indicates CONTRACTOR's intended implementation of the SESC plan for the project, including a schedule.
 - c. PERMITTING AUTHORITY, upon approval of the implementation plan, will issue CONTRACTOR an "Authorization to Proceed with Earth Change" or a SESC Permit, which is to be posted at the jobsite.
 - d. CONTRACTOR shall implement soil erosion and sedimentation control measures as required by the project's SESC plan, SESC Implementation Plan, DTMB's Soil Erosion and Sedimentation Control Guidebook, dated February 2005, and as directed by the PROFESSIONAL, PERMITTING AUTHORITY, DTMB SESC inspector, and/or DTMB Project Director.
 - e. CONTRACTOR and the PERMITTING AUTHORITY or PROFESSIONAL shall inspect the Site weekly and after significant rain events.
 - 1) CONTRACTOR shall maintain and inspect SESC measures throughout the course of the project.
 - 2) DTMB recommends that CONTRACTOR inspect and maintain erosion and sedimentation controls on a daily basis.
 - f. CONTRACTOR shall install temporary erosion and sedimentation control measures prior to or upon commencement to earthwork activities.
 - g. CONTRACTOR shall perform sweeping as needed to remove any sediment tracked off-Site. Frequency of sweeping shall be based on Site conditions.
 - h. CONTRACTOR shall perform dust control as needed based on Site conditions and as requested by the PERMITTING AUTHORITY or PROFESSIONAL.
 - i. Disturbed areas that will remain idle during construction must be temporarily stabilized, including soil stockpiles, using DTMB SESC Best Management Practices.
 - j. CONTRACTOR shall correct non-conforming SESC measures within 24 hours if Waters of the State are being impacted or within 48 hours for routine maintenance items. Other SESC maintenance shall be completed as soon as possible but never more than 5 days after detection.
 - k. CONTRACTOR shall complete permanent soil erosion control measures for any disturbed land area within 5 calendar days after final grading or the final earth change has been completed. CONTRACTOR shall maintain temporary control

measures until permanent soil erosion control measures are in place and the area is stabilized.

- I. CONTRACTOR shall remove temporary erosion control measures after permanent soil erosion measures are in place and the area is stabilized. Care shall be taken during removal to prevent soil erosion and sedimentation.

1.3. JOB CONDITIONS

A. CONTRACTOR shall comply with the following job conditions:

1. Dewatering during construction, if any, shall be collected and disposed in accordance with all applicable permit conditions and Section 02 73 00, Wastewater Handling and Disposal. Discharge to the ground surface, drains, sanitary sewer, storm sewer, or other watercourse is prohibited.
2. CONTRACTOR or their subcontractor shall take all necessary precautions to prevent disturbance or damage of the existing SESC measures at the Site. If existing SESC measures are damaged or disturbed by CONTRACTOR or their subcontractor, CONTRACTOR shall be responsible for repair/maintenance of these controls at no additional cost to the OWNER.
3. Even though a specific erosion control measure is not called out on the plans or in the specifications, this does not relieve CONTRACTOR from his obligation under the Michigan Soil Erosion and Sedimentation Control Act of Part 91 to properly control and/or prevent all erosion caused by CONTRACTOR's construction operation.
4. CONTRACTOR shall employ SESC measures as necessary to ensure the retention and removal of any sediment from stormwater which enters an existing storm sewer or conveyance along the construction route. If eroded material enters a storm sewer system, CONTRACTOR shall clean all catch basins, manholes, pipes, and conveyances following completion of the construction and prior to receipt of final payment.
5. CONTRACTOR shall maintain the roadways in a passable condition until the work is completed and shall be responsible for any necessary signage and traffic maintenance provisions in accordance with the local and Michigan Department of Transportation (MDOT) regulations.

1.4. PERMITS

- #### A. Prior to starting earthwork, CONTRACTOR shall obtain and pay for all necessary permits including the "Authorization to Proceed with Earth Change" from the PERMITTING AUTHORITY.

1.5. SUBMITTALS

A. SESC Implementation Plan:

1. Submit to the PERMITTING AUTHORITY for approval the SESC Implementation Plan and Permit Application in accordance with Section 1 35 13, Special Project Procedures Part 1.2. Provide a copy of this permit application submittal to the PROFESSIONAL.
2. CONTRACTOR shall include in the Implementation Plan a description of construction staging and maintenance of the Site relative to soil erosion and sedimentation controls. Indicate on the Site plan approximate areas of planned disturbance of soils, soil staging areas and methods, and stockpile coverage plans during the Project.

B. Copies of Permits:

1. Authorization to Proceed with Earth Change.
2. Any other permits.

PART 2 PRODUCTS

2.1. MATERIALS FOR SOIL EROSION AND SEDIMENTATION CONTROLS

- A. Materials for temporary soil erosion and sedimentation controls shall be as shown or indicated on the Drawings and as specified in the Contract Documents.
- B. Materials for permanent soil erosion and sedimentation controls shall be as shown or indicated on the Drawings and as specified in the Contract Documents.

PART 3 EXECUTION

3.1. SOIL EROSION AND SEDIMENTATION CONTROL

- A. Installation and Maintenance of Soil Erosion and Sedimentation Controls – General:
 - 1. General:
 - a. Provide soil erosion and sedimentation controls as shown and indicated on the Construction Drawings and elsewhere in the Contract Documents. Provide soil erosion and sedimentation controls as the Work progresses into previously undisturbed areas.
 - b. Installation of soil erosion and sedimentation controls shall be in accordance with the applicable regulatory requirements indicated in Part 1.2 of this Section and as specified on the Drawings, unless otherwise shown or indicated in the Contract Documents.
 - c. Use necessary methods to successfully control soil erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Part 1.2 of this Section, to control soil erosion and sedimentation during the Project.
 - d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent soil erosion and sedimentation. Provide temporary measures for controlling soil erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
 - e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provisions shall be made for regulating drainage and controlling soil erosion and sedimentation, subject to the PROFESSIONAL's approval.
 - f. Provide soil erosion and sedimentation controls, including stabilization of soils, at the end of each workday.
 - 2. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sedimentation control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
 - 3. In general, implement construction procedures associated with, or that may affect erosion and sediment control to ensure minimum damage to the environment during construction.
 - 4. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
 - 5. Inspection and Maintenance:
 - a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; apply corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent SESC measures have been established.
 - b. Inspect not less often than the frequency specified in Part 1.2 of this Section.
 - c. Repair or replace damaged erosion and sedimentation controls within 24 hours of CONTRACTOR becoming aware of such damage.
 - d. Periodically remove silt and sediment that has accumulated in or behind sedimentation and erosion controls. Properly dispose silt and sediment.

- e. Maintain erosion and sedimentation controls in effective working condition until the associated drainage area has been permanently stabilized.
 - 6. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
 - 7. Failure to Provide Adequate Controls: In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and siltation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control. Cost of such work, plus engineering and inspection costs, will be deducted from monies due CONTRACTOR.
- B. Protection of Stormwater Drainage Inlets and Catch Basins:
- 1. Protect each drainage inlet and catch basin that has the potential to receive stormwater runoff from exposed soils, and does not discharge into a stormwater settlement basin.
 - 2. Install and maintain inlet filter bags inside of drainage inlet or catch basin in accordance with manufacturer's instructions and as specified on the Construction Drawings.
 - 3. Inlet filter bags shall not pose any obstruction above the elevation of the drainage inlet or catch basin grate requiring barricades or flashers.
 - 4. When removing silt and sediment from inlet filter bag, CONTRACTOR shall not dump filter bag's contents into the drainage inlet or catch basin.

END OF SECTION

SECTION 32 60 00

SITE RESTORATION

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and perform landscaping Work.
 - 2. The extent of the landscaping Work shall be performed as shown and as specified in schedules.
 - 3. The types of landscaping Work required include the following:
 - a. Topsoil stockpiled for reuse.
 - b. Topsoil from off-site sources if topsoil is insufficient to complete the Work of this Section.
 - c. Grass seed mixture.
 - d. Soil amendments.
 - e. Fertilizers.
 - f. Miscellaneous landscape materials.
 - g. Guaranties.
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with related Work.
 - 2. Comply with all other requirements of Division 30.

1.2. QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. General:
 - a. Ship landscape materials with certificates of inspection as required by governmental authorities.
 - b. Comply with governing regulations applicable to landscape materials.
 - c. PROFESSIONAL will request inspection of delivery slips for materials to verify specified quantities of bulk deliveries of soil amendments and fertilizers.
 - 2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Analytical Chemists, wherever applicable or as further specified.
 - 3. Off-Site Topsoil: Obtain topsoil from local sources or from areas having similar soil characteristics to that found at the site of the Work. Obtain topsoil only from naturally well-drained sites where topsoil occurs in depth of not less than 4 inches; do not obtain from bogs or marshes.
 - 4. Topsoil stockpiled for reuse: Topsoil will be inspected by PROFESSIONAL before reuse. If deficiencies in the topsoil are found, they shall be corrected at no additional expense to OWNER.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.
 - 1. ASTM C 602, Agricultural Liming Materials.
 - 2. ASTM D 2487, Classification of Soils for Engineering.
 - 3. ASTM D5268, Topsoil Used for Landscape Purposes, Standard Specification for.

4. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names.
5. Official Seed Analysts of North America, Standards of Quality.
6. FSO-F-241D, Fertilizer, Mixed, Commercial.

1.3. SUBMITTALS

- A. Topsoil: Submit to PROFESSIONAL for approval the following:
 1. Five (5) Business Days before delivery of off-site topsoil, certifications for off-site borrow, as specified in Divisions 1 - 16, and written statement giving the location of the properties from which the topsoil is to be obtained, the names and addresses of the supplier(s), the depth to be stripped and the crops grown during the past 2 years.
- B. Guaranty: Submit for approval a written guaranty, in the terms specified under "Guaranty" provisions of these Specifications, signed by CONTRACTOR.

1.4. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials:
 1. Deliver packaged materials in original, unopened containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery.
 2. Furnish seed in sealed, standard containers.
 3. Remove unacceptable material immediately from project site.
- B. Storage of Materials:
 1. Store and cover materials to prevent deterioration. Remove packaged materials, which have become wet or show deterioration or water marks from the site. Replace at no cost to OWNER.
 2. Seed that is wet or moldy or that has been otherwise damaged in transit or storage is not acceptable. Replace at no cost to OWNER.

1.5. JOB CONDITIONS

- A. Environmental Requirements:
 1. Proceed with and complete the Work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape Work required.
 2. Do not spread seed when wind velocity exceeds 5 miles per hour.
 3. Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.
- B. Scheduling:
 1. Plant or install materials only during normal planting seasons for each type of landscape Work required.

1.6. ALTERNATIVES

- A. Do not make substitutions. Substitutions may be allowed, by PROFESSIONAL in writing, at the varietal level only. Submit to PROFESSIONAL proof of non-availability and proposal for use of equivalent material.

1.7. GUARANTY

- A. Guaranty ground cover until Final Completion of the Contract Time.

PART 2 PRODUCTS

2.1. MATERIALS

A. Topsoil:

1. Topsoil shall be stockpiled for re-use in landscape Work. If the quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape Work.
2. Provide fertile, friable, natural sandy loam, loam, or silt loam, according to the USDA Soil Texture Classification, that is free of pests and pest larvae.
3. Topsoil shall be capable of sustaining vigorous plant growth, and shall be free of any admixture of subsoil, clods of hard earth, plants or roots, sticks, stones larger than 1 inch in diameter, or other extraneous material harmful to plant growth.
4. Topsoil shall comply with the requirements of ASTM D 5268:
 - a. Less than 5 percent deleterious materials, as determined by the percentage retained on a No. 4 sieve.
 - b. Organic content of 2 to 20 percent, as determined by ignition loss of oven-dried samples passing No. 4 sieve (ASTM D-2974).
 - c. Sand content of 20 to 60 percent, as determined by the percentage of the fraction passing the No. 4 sieve that is retained on a No. 200 sieve (ASTM D-1140).
 - d. Silt and clay content of 35 to 70 percent, as determined by subtracting the organic content and the sand content from 100 percent.
 - e. pH-adjusted with ferrous sulfate or ground limestone to provide pH 5.0 to pH 7.0 at time of installation of meadow areas, unless particular species of grass or wildflower stand requires a different pH to meet its growing needs.

B. Commercial Fertilizers:

1. Fertilizer:
 - a. Commercial designation of 18-24-6. Provide a complete fertilizer of neutral character with a minimum of 75 percent nitrogen derived from natural organic sources.
 - b. Product and Manufacturer: Provide one of the following:
 - 1) Scotts Starter Fertilizer by Scott and Sons Incorporated.
 - 2) Or equal.

C. Grass Materials:

1. Upland Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination as specified by MDOT Standard 8.21.09 or MDNR seed mixture consisting of, 75% field rye grass, 15% creeping red fescue, 8.5% orchard grass, 1.35% inert and 0.15% weed. Provide seed of the grass species, proportions, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

D. Mulch: CONTRACTOR shall provide the following mulch as needed and necessary to amend the excavation areas and other areas disturbed by the Work.

1. Mulch shall be straw mulch, free of plant-growth or germination inhibitors, with a maximum moisture content of 15% and a pH range of 4.5 to 6.5.

PART 3 EXECUTION

3.1. INSPECTION

- #### A. CONTRACTOR shall examine the subgrade, verify the elevations, observe the conditions under which Work is to be performed, and notify PROFESSIONAL of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to PROFESSIONAL and OWNER.

3.2. PREPARATION

A. Seed Turfbed Preparation:

1. Loosen subgrade of turfbed areas to a minimum depth of 4 inches. Remove stones over 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
2. Spread topsoil to minimum depth of 4 inches after natural settlement and light rolling.
 - a. Do not spread topsoil while in a frozen condition or when moisture content is so great that excessive compaction will occur nor when so dry that dust will form in the air or that clods will not break readily.
3. Apply commercial fertilizers in the following quantities:
 - a. For grass apply only at a rate sufficient to supply 1.5 pounds of nitrogen per 1,000 square feet.
4. Apply commercial fertilizers within 10 days of seeding.
5. Apply commercial fertilizers in two operations. First application shall be $\frac{3}{4}$ of total amount.
6. Thoroughly and evenly incorporate commercial fertilizers with the soil to depth of 3 inches by discing, or other approved method. a. In areas inaccessible to power equipment, use hand tools.
7. Grade turfbed areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous foreign material in excess of 1-inch in diameter. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
8. Apply a second dressing of fertilizer. Use $\frac{1}{4}$ of the total required amount.
9. Moisten prepared turfbed areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create muddy soil conditionS.
10. Restore turfbed areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

3.3. INSTALLATION

A. Seeding Field Cover:

1. Either hydraulic or mechanical methods may be used. Prepare seedbed as described for turfbed under 3.2.A. above.
2. Seeding shall be done during the typical growing season for the area.
3. Apply a minimum of 4 pounds of seed per 1,000 square feet of disturbed area.
4. Prevent foot or vehicular traffic, or the movement of equipment over the seeded areas. Reseed areas damaged as a result of such activity.
5. Prevent the seeded areas from drying out. After seedlings appear in about 2-3 weeks reseed all bare spots larger than 18 inches in diameter. Areas to be reseeded shall be hand raked to scarify the surface and seed shall be applied by cyclone spreader. Lightly rake the seed into the soil.

B. Reconditioning Existing Turf:

1. Recondition existing turf areas damaged by CONTRACTOR's operations including storage of materials and equipment and movement of vehicles. Also recondition existing turf areas where minor re-grading is required.
2. Provide fertilizer, seed, and soil amendments as specified for new turf and as required to provide a satisfactorily reconditioned turf. Provide new topsoil as required to fill low spots and meet new finish grades.
3. Cultivate bare and compacted areas thoroughly to provide a satisfactory planting bed.
4. Remove diseased and unsatisfactory turf areas; do not bury into soil. Remove topsoil containing foreign materials resulting from CONTRACTOR's operations including oil drippings, stone, gravel, and other loose building materials.
5. In areas approved by PROFESSIONAL, where substantial turf remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, and cultivate soil, fertilize, and

- seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist condition.
6. Water newly planted areas and keep moist until new turf is established.

3.4. MAINTENANCE

- A. Begin maintenance immediately after planting.
- B. Maintain turf for not less than the period stated below, and longer as required to establish an acceptable stand, as determined by PROFESSIONAL.
1. Grass seed areas, not less than 120 days
 2. After grass has started, reseed repeatedly all areas greater than 8 inches square which fail to show a uniform stand of grass for any reason whatsoever until all areas are covered with a satisfactory stand of grass, as determined by PROFESSIONAL, is achieved.
- C. Potable water may not be available on site. Be prepared to provide potable water and maintain temporary piping and hoses and watering equipment as required to convey water from water source and to keep landscape Work moist as required for proper growth. CONTRACTOR shall supply required irrigation materials, equipment, and potable water.

3.5. CLEANUP AND PROTECTION

- A. During landscape Work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.
- B. Protect landscape Work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape Work as directed.
- C. Completely clean any overspread, on areas not designated to receive seeding to satisfaction of PROFESSIONAL.
- D. Remove all rubbish, equipment and rejected materials from the site.
- E. Protection includes all temporary fences, barriers, and signs and other Work incidental to proper maintenance.

3.6. INSPECTION AND ACCEPTANCE

- A. When the landscape Work is completed, including maintenance, PROFESSIONAL will make an inspection to determine acceptability.
- B. Where inspected landscape Work does not comply with the requirements, replace rejected Work and continue specified maintenance until reinspected by PROFESSIONAL and found to be acceptable. Remove rejected plants and materials promptly from the project site.

END OF SECTION

SECTION 35 20 23

DREDGING AND COVER

PART 1 GENERAL

1.1. DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to:
 - a. Remove and dispose of debris within the Dredge Area(s) prior to and/or during dredging in a manner that prevents accidental spillage of sediment or debris.
 - b. Perform all sediment dredging to the horizontal and vertical limits, and/or to the elevations, in the areas designated in the Contract Documents, including the Drawings.
 - c. Perform dredging cleanup passes, as directed by the PROFESSIONAL, as required based on confirmation sediment sampling as required by the Contract Documents.
 - d. Import cover material to the site, transport fill material to cover areas as determined based on confirmation sediment sampling, and place cover material as required by the Contract Documents, or as directed by the PROFESSIONAL.
 - 2. No classification of dredged materials will be made. Dredging includes all materials regardless of type, character, composition, moisture, or condition thereof.
- B. Related Sections:
 - 1. Section 01 57 00, Temporary Controls.
 - 2. Section 01 71 23, Field Engineering.
 - 3. Section 02 61 10, Handling and Disposal of Impacted Material.
 - 4. Section 02 73 00, Wastewater Handling and Disposal.
 - 5. Section 31 05 15, Fill Materials for Earthwork.

1.2. TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
 - 1. Additional Dredge Pass: Additional Dredge Pass(es) may be directed by the PROFESSIONAL to remove additional sediments that are estimated to exceed the criteria for removal established for the project, based on the chemical analysis of post-dredging sediment cores. An additional dredge pass includes removal of the top 6 inches of sediment remaining in the DMU or sub-DMU identified by the PROFESSIONAL based on confirmation sampling if the depth of remaining sediment is 6 inches or greater.
 - 2. Dredge Management Unit (DMU): A DMU is a portion of the sediment removal area identified to facilitate removal confirmation. DMUs are shown on the Drawings.
 - 3. Debris: Debris includes, but is not limited to:
 - a. Wood.
 - b. Terrestrial vegetation.
 - c. Manmade objects.
 - d. Floating and/or submerged aquatic vegetation
 - 4. Sub-DMU: A sub-DMU is a portion of the DMU defined by and associated with the location of an individual discreet sample collected during confirmation sampling.
- B. Operations Monitoring and Maintenance Plan (OM&M Plan): The OM&M Plan will be prepared by the PROFESSIONAL as part of the pre-mobilization activities. The OM&M Plan will describe monitoring and maintenance that will be conducted by the PROFESSIONAL during remedial activities.

1.3. QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. 40 CFR 761.79, USEPA, Toxic Substance Control Act (TSCA).
 - 2. United States Coast Guard (USCG) Regulations.
 - 3. State of Michigan Regulations:
 - a. Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).
 - b. Part 413, Transgenic and Nonnative Organisms, of the NREPA.
 - c. MDNR, Fisheries Division, Fisheries Order 245, Fish Disease Control.
- B. Policy and Procedure Guidance Documents:
 - 1. MDEQ. 2014. Policy and Procedure Number QOL-2-2014 - Invasive Species Decontamination for Field Operations in Michigan. Effective December 9, 2014.

1.4. SUBMITTALS

- A. Pre-Construction
 - 1. Dredging and Cover Work Plan: CONTRACTOR shall submit a Dredging and Cover Work Plan (separate or as part of CONTRACTOR's Operations Plan [as required by Section 01 11 00, Summary of Work]). At a minimum, the Dredging and Cover Work Plan shall include:
 - a. Description, dimensions, capacity, and drawings or photographs of the removal equipment (include number and type of dredges or excavators including bucket types, dredge platforms, etc.) to be used by CONTRACTOR during sediment dredging and debris removal activities. Description, dimensions, and capacity of water diversion and infiltration water management if CONTRACTOR elects to perform material removal activities in the dry. Description of work must include anticipated tolerance to be achieved during dredging with the equipment proposed. Identify sediment materials/areas that will be removed with land-based removal equipment, if any.
 - b. Method(s) for handling debris encountered while sediment is dredged.
 - c. Description, dimensions, capacity, and drawings or photographs of the equipment (include number and type of dredges or excavators including bucket types, dredge platforms, etc.) to be used by CONTRACTOR for cover material placement.
 - d. Description, number and type of barges, trucks, or other vehicles to be used for dredged material (including debris) transport and cover material transport.
 - e. Description of dredging equipment positioning and visualization software to be utilized for sediment removal and cover placement, include vertical and horizontal positioning accuracy.
 - f. Measure(s) to avoid or minimize possible spillage during loading, transport and unloading procedures.
 - g. Certification that equipment is capable of operating with no leakages of machine oil or other harmful substances into the Manistique River channel.
 - h. Description of the sequencing of dredging (order of DMUs to be dredged) and backfilling, as well as movement between DMUs.
 - i. Delineation of the Work Areas to be used by CONTRACTOR, including the areas to be used for sediment off-loading and staging, dredged material dewatering and stabilization, temporary stockpiling of debris and de-watering.
 - 2. Inspection reports:
 - a. Prior to mobilization of vessels, provide third-party inspection reports certifying that each vessel used in performing Work is seaworthy and includes all required safety gear, equipment, lighting and markings in accordance with applicable United States Coast Guard Regulations.

- b. Prior to mobilization of vessels, provide documentation that vessels and equipment have been decontaminated for invasive species in accordance with MDEQ Policy and Procedures Number QOL-2-2014.
 - 3. Pre-construction survey results (if performed):
 - a. Submit results of debris survey performed in accordance with Paragraph 3.1.B of this Section.
 - b. Submit results of pre-construction bathymetric survey performed in accordance with Paragraph 3.1.C of this Section.
- B. During Construction:
 - 1. Daily Dredge Reports: Daily Dredge Reports shall be filled out each work day by CONTRACTOR and provided to the OWNER and PROFESSIONAL as part of CONTRACTOR's Daily Progress Report required by Section 01 71 23, Field Engineering. If more than one dredge is used, provide one Daily Dredge Report for each dredge.
 - 2. Misplaced Material Report:
 - a. Provide written confirmation following misplacement of materials, including the description, location and quantity of such obstructions to the OWNER and PROFESSIONAL within 24 hours of the incident.

PART 2 PRODUCTS

2.1. DREDGE AND TRANSPORT EQUIPMENT

- A. CONTRACTOR is responsible for determining the type, size, and number of equipment necessary to perform the activities covered in this Section. Equipment shall be suitably sized to perform the required work activities and shall be compliant with state and federal regulations for waterborne equipment.
- B. Dredges
 - 1. Dredging equipment shall be equipped with real-time kinematics differential global positioning system (RTK DGPS) controls such as WINOPS or HYPACK, or equivalent, to enable accurate positioning of the bucket and monitor dredging and backfilling progress
 - 2. Material dredging equipment shall have a positioning tolerance of plus or minus 2 inches vertically and plus or minus 3 inches horizontally.
 - 3. All dredge buckets (if applicable) must be equipped with monitoring capabilities to inform the dredge operator if the bucket is not completely closed.
 - 4. The dredging bucket (if applicable) shall be designed to maintain enclosure of sediments when the bucket is being raised through the water column; minimize, to the maximum extent practical, the generation of suspended sediments during bucket lowering, closing, and raising in the water column; and minimize the amount of water contained in the dredge bucket as it is closed. The bucket shall include features designed by the bucket's manufacturer that allow sediment to be removed at near in-situ densities and to allow free water overlying the sediment in the bucket to drain once the dredge bucket has been raised above the water surface.
 - 5. Hydraulic dredge pumps (if applicable) shall have sufficient power to transport the sediment slurry from the dredging location to the sediment staging area. If additional power is needed, CONTRACTOR shall supply additional booster pumps at no additional cost to the OWNER. CONTRACTOR shall provide secondary containment of booster pumps as required by applicable laws and regulations.

2.2. FILL MATERIALS

- A. Cover Fill:
 - 1. Cover fill shall meet the requirements of "Cover Fill" provided in Section 31 05 15, Fill Materials for Earthwork, Part 2.

PART 3 EXECUTION

3.1. PREPARATION

- A. In preparation for dredging activities, CONTRACTOR shall assess the site-specific conditions presented in the reports referenced in Section 01 11 00, Part 1.2. Following their assessment of site conditions, CONTRACTOR shall determine the appropriate dredging equipment for completion of the Work, and shall choose such equipment and any associated features to minimize, to the extent practical, generation of suspended sediments.
- B. If CONTRACTOR elects to perform pre-construction bathymetric and/or debris survey as discussed in Section 01 71 23, Field Engineering, CONTRACTOR shall perform such work prior to the start of dredging.
- C. The horizontal and vertical extents of sediment removal are provided on the Drawings.
 - 1. Except where noted in the Drawings, CONTRACTOR should consider the following general assumptions/boundary conditions, which were accounted for in the provided dredge prism, when determining the appropriate means and methods of dredging activities:
 - a. Transitions between the removal area boundary to existing sediment grade will be 2H:1V (i.e., 2 horizontal:1 vertical).
 - b. For adjacent removal polygons with varying removal depths, the removal cut between polygons shall be tapered at a 2H:1V slope starting at the bottom and boundary of the DMU with the deeper cut.
 - c. Where removal is necessary adjacent to the shoreline, a 3H:1V slope shall be imparted extending from the shoreline to the bottom of the removal polygon in question.
 - 2. CONTRACTOR shall generate their own removal quantity estimate and in doing so should take into account the volume of materials related to overdredging and/or ancillary activities (e.g., debris, etc.) for which removal may be necessary to complete the Work.
- D. Install turbidity and sheen controls in accordance with Section 01 57 00, Temporary Controls.

3.2. DREDGING

- A. Existing riprap shall be removed, cleaned, and stockpiled onsite for use in restoration activities following dredging. Upon completion of dredging, CONTRACTOR shall replace riprap to restore riprap areas to original condition.
- B. Debris shall be removed and managed in accordance with Section 02 61 10, Handling and Disposal of Impacted Material.
- C. All water that accumulates in scows (if applicable) or in diversion area (if applicable) shall be collected and managed in accordance with Section 02 73 00, Wastewater Handling and Disposal.
- D. Survey and define in the field the horizontal limits of DMUs using buoys or other acceptable markers. Survey control shall be maintained throughout dredging activities, and shall be utilized to confirm the horizontal and vertical extents of removal have been achieved in accordance with Section 01 71 23, Field Engineering.
- E. OWNER will provide to CONTRACTOR, prior to initiation of the remedial activities, additional performance criteria for dredging operations (e.g., fall height of a dredge bucket, drainage of free liquid, material conveyance requirements) as appropriate based on the dredging equipment and method provided in CONTRACTOR's Dredging and Cover Work Plan.

- F. CONTRACTOR shall determine the sequence of dredging activities; however, removal activities shall be sequenced such that, to the extent practicable:
1. TSCA removal areas shall be dredged before non-TSCA removal areas.
 2. Impacted materials shall not be transported over areas in which Cover Fill has been installed.
- G. To mitigate the potential effect of propeller wash on the impacted sediments, to the extent practicable, CONTRACTOR shall operate equipment used for dredging from within areas already remediated.
- H. CONTRACTOR shall perform dredging to the limits shown in the Drawings or as required to complete Additional Dredge Pass(es) directed by the PROFESSIONAL.
1. The allowable tolerance for dredging shall be -6 inches to +0 inches from dredge prism elevations shown in the Drawings.
 2. If dredging cannot be performed to dredge prism elevations shown in the Drawings due to obstructions and/or refusal, CONTRACTOR shall immediately notify the PROFESSIONAL and survey the location of the obstruction/refusal.
 3. Field quality control testing for dredging will be performed as specified in "Field Quality Control" Article in Part 3 of this Section:
- I. All material that slides, falls, or caves into the established limits of removal shown in the Drawing due to any cause whatsoever, shall be removed and disposed in with this Section and Section 02 61 10, Handling and Disposal of Impacted Material at CONTRACTOR's expense. No extra compensation will be paid CONTRACTOR for removing/disposing of these materials or for any materials ordered for refilling the void areas left by the slide, fall or cave-in.
- J. All removed materials (e.g., debris, vegetation) subject to off-site disposal and all dredged materials shall be handled in accordance with Section 02 61 10, Handling and Disposal of Impacted Material.
- K. CONTRACTOR shall plan construction activities to minimize conflict with other vessels within the waterway (navigation channel). The shifting or moving of dredges, or other Work-related water vessels, or the interruption of dredging operations may be required to accommodate the movement of other vessels and floating equipment not associated with CONTRACTOR's activities. Where such conflicts cannot be avoided, required coordination by CONTRACTOR and those impacted by the Work must be arranged, and the OWNER and PROFESSIONAL must be informed of such conflicts and plans to prevent future conflicts. Non-project vessels shall not be permitted in the Work Area during conduct of work without OWNER approval.
1. CONTRACTOR shall coordinate with the OWNER, and local marina owner to identify requirements and controls for providing access to marina users.
- L. CONTRACTOR shall provide lighting and signage installations for the duration of in-water work in accordance with all applicable USCG standards and regulations.
- M. CONTRACTOR shall conduct the Work in such a manner that material or other debris are not placed outside of dredging limits or otherwise deposited in basins, docking areas, navigational channels, or other areas outside area confined within the turbidity curtain (Section 01 57 00, Temporary Controls). Should dredged material or other debris be placed into areas described above as a result of CONTRACTOR's operations, OWNER shall be immediately notified and such material or debris may be required to be removed by CONTRACTOR, at CONTRACTOR's expense, to the satisfaction of OWNER.

3.3. BANK PROTECTION

- A. CONTRACTOR shall protect the existing shoreline and structures along the shoreline (e.g., docks, retaining walls). CONTRACTOR shall be responsible for repairing and/or replacing any shoreline amenities that are damaged during or removed to facilitate construction.
- B. Where removal is necessary adjacent to the shoreline, CONTRACTOR shall maintain a 3H:1V slope (or shallower) from the existing shoreline to the bottom of the removal polygon as shown in the Drawings. Sediment removal at a steeper slope is prohibited unless otherwise approved by PROFESSIONAL. CONTRACTOR shall be responsible for installing additional protection measures as directed by the PROFESSIONAL if the stable slope is not maintained.

3.4. COVER FILL PLACEMENT

- A. Cover Fill shall be placed as follows:
 - 1. DMU A: Install 12 inches of Cover Fill over the entire limits of the DMU A.
 - 2. All other DMUs: As directed by the PROFESSIONAL based on results of Confirmation Sediment Sampling (Part 3.4.B of this Section), install 6 inches of Cover Fill over the limits of the DMU or sub-DMU identified for cover placement.
- B. Cover Fill shall not be placed until all dredging activities have been completed in a respective DMU. If dredging equipment is used for cover placement, the equipment shall be decontaminated prior to handling fill.
- C. CONTRACTOR shall choose an appropriate placement method to minimize resuspension of residual bottom sediments to prevent mixing with the Cover Fill.
- D. Cover Fill shall be placed in one lift and transitions from cover to non-cover areas shall be at 2H:1V.
 - 1. The allowable tolerance for placement of Cover Fill shall be -0 inches to +6 inches from the specified design thickness, or as approved by PROFESSIONAL.
 - 2. If based on field quality control testing specified in "Field Quality Control" Article in Part 3 of this Section:
 - a. The minimum design thickness is not met, CONTRACTOR shall place additional material as directed by PROFESSIONAL.
 - b. The maximum tolerance for the design thickness is exceeded, CONTRACTOR shall identify any areas of overfilling to OWNER for further discussion. OWNER shall not be responsible for any costs associated with excess Cover Fill material or associated placement activities.
- E. Survey control shall be maintained throughout cover placement activities, and shall be utilized to confirm the horizontal and vertical extents of placement have been achieved in accordance with Section 01 71 23, Field Engineering.

3.5. EQUIPMENT DECONTAMINATION

- A. Equipment in contact with TSCA material shall be decontaminated in accordance with 40 CFR 761.79 prior to handling non-TSCA material and prior to equipment demobilization.
- B. Prior to equipment demobilization, decontaminate equipment in accordance with the CONTRACTOR's HASP and MDEQ Policy and Procedure Number QOL-2-2014.

3.6. FIELD QUALITY CONTROL

- A. General:
 - 1. CONTRACTOR shall provide safe access to PROFESSIONAL to perform and observe quality control activities as described in this Section.

- B. Removal Confirmation:
1. Sediment Sampling:
 - a. CONTRACTOR shall notify the PROFESSIONAL at least 1 day in advance of completing dredging activities in each DMU to allow for scheduling of sediment sampling.
 - b. Confirmation sediment samples will be collected by PROFESSIONAL as described in the OM&M Plan to determine a surface-weighted average concentration (SWAC; based on the top 6 inches of sediment) of PCBs within the respective DMUs. CONTRACTOR will be responsible for performing additional dredging pass(es) and/or cover placement as directed by the PROFESSIONAL based on results of sampling and in accordance with the following:
 - 1) If the SWAC within the DMU is less than 1 milligrams per kilogram (mg/kg), no additional remedial activities will be performed within that DMU.
 - 2) If the SWAC within the DMU is greater than 1 mg/kg, up to two additional dredge passes will be conducted in the DMU where feasible (e.g., no bedrock, soft sediment greater than 6 inches thick) and as directed by the PROFESSIONAL. Additional confirmation sampling will be performed following each dredging pass.
 - 3) If, after the final dredge pass, the SWAC is greater than 1 mg/kg, a sand cover will be placed over that DMU as directed by the PROFESSIONAL and in accordance with Part 3.4 of this Section.
 2. Post-Dredging Bathymetric Survey:
 - a. CONTRACTOR shall perform bathymetric survey of removal area after completion of dredging in each DMU (including the performance and approval of confirmation sampling) accordance with Section 01 71 23, Field Engineering.
- C. Cover Placement Confirmation
1. Cover Thickness Probing:
 - a. CONTRACTOR shall verify layer thickness through TIN subtraction of post-dredging (pre-cover) and post-construction bathymetric survey collected in accordance with Section 01 71 23, Field Engineer. CONTRACTOR shall supplement verification with the collection of cores (via manual techniques) at an approximate frequency of 2 cores per sub-DMU. Core locations shall be discussed with the PROFESSIONAL prior to collection.
 2. Post-Cover Bathymetric Survey:
 - a. CONTRACTOR shall perform bathymetric survey of DMUs receiving cover in accordance with Section 01 71 23, Field Engineering.

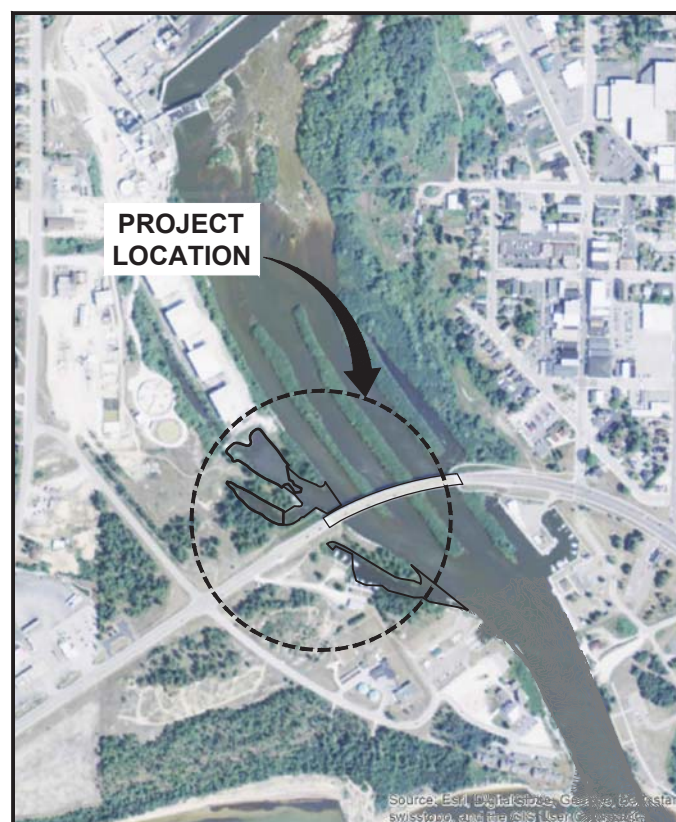
END OF SECTION

APPENDIX C

Contract Drawings



CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS



APRIL 2016



INDEX TO DRAWINGS



ARCADIS OF MICHIGAN, LLC.

- 1 EXISTING SITE PLAN
- 2 SITE DEVELOPMENT PLAN
- 3A TYPICAL LAYOUT - SOIL EROSION SEDIMENTATION CONTROL PLAN
- 3B SOIL EROSION SEDIMENTATION CONTROL DETAILS & NOTES
- 3C SOIL EROSION SEDIMENTATION CONTROL DETAILS & NOTES
- 4 REMOVAL LIMITS AND DEPTHS
- 5 ZONE 3 DREDGE PRISM CONTOURS
- 6 ZONE 4 DREDGE PRISM CONTOURS
- 7 CROSS SECTIONS
- 8 CROSS SECTIONS
- 9 ZONE 3 DREDGE MANAGEMENT UNITS
- 10 ZONE 4 DREDGE MANAGEMENT UNITS
- 11 MISCELLANEOUS DETAILS

CITY: SYRACUSE, NY DIV/GROUP: ENV/CAD DE: K.SARTORI LD: K.SARTORI PIC/PW/TM: L.BAKER LYNON+*OFF=REF*
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esi_siteimage_2014.jpg

1"=140'

140'

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140'

280'

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Professional Engineer's Name MARK GRAVELDING		
Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by EAB	Drawn by KLS	Checked by HMY



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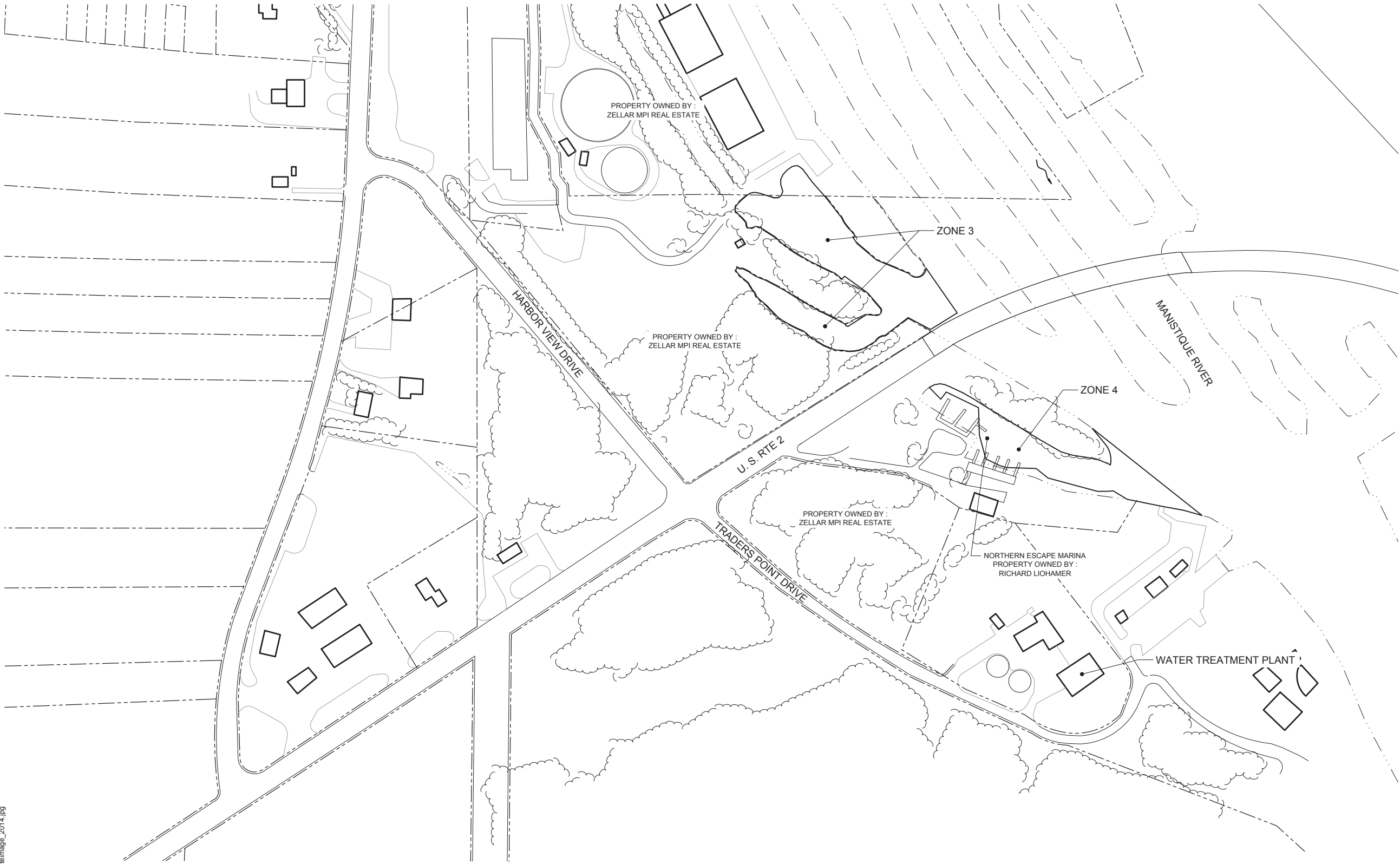
ARCADIS OF MICHIGAN, LLC.

STATE OF MICHIGAN • MANISTIQUE RIVER, SCHOOLCRAFT COUNTY, MI

CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

EXISTING SITE PLAN

ARCADIS Project No. B0038001.0001.0006B
Date APRIL 2016
ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240



LEGEND:

VEGETATION

PROPERTY LINE (APPROXIMATE)

EDGE OF WATER

ZONE OUTLINE

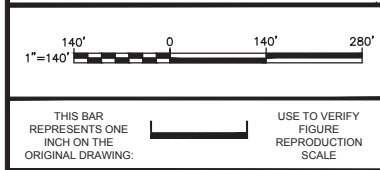
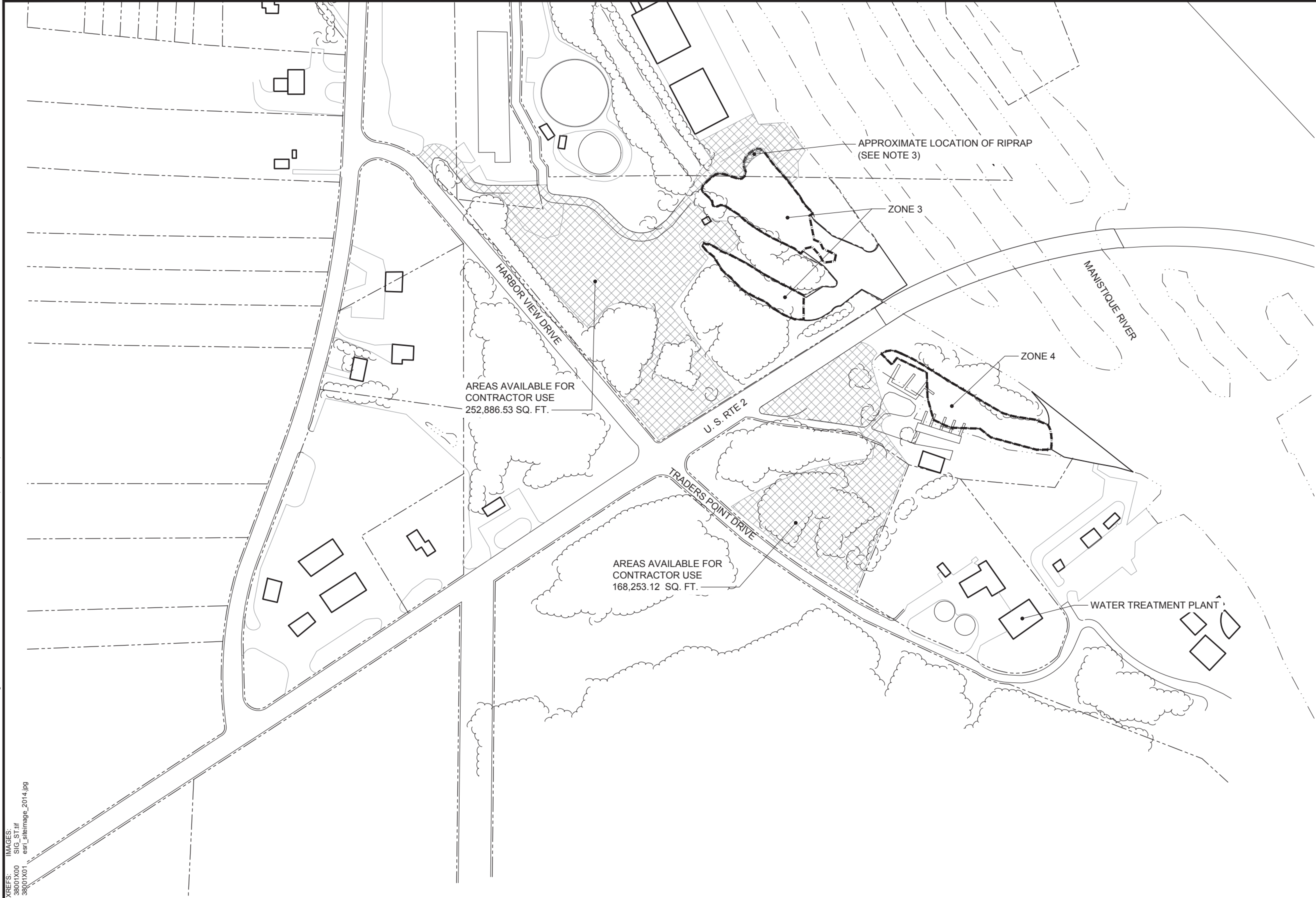
- NOTES:
1.

BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEX, GETMAPPING, AEROGRIID,
IGN, IGP, SWISSTOPO, AND THE GIS USER
COMMUNITY.
2.

PROPERTY OWNERS ARE IDENTIFIED FOR
AREAS ANTICIPATED TO BE DISTURBED.
PROPERTY LINES RECEIVED FROM THE CITY
OF MANISTIQUE IN JANUARY 2016.



CITY: SYRACUSE, NY DIV: GROUP: ENVICAD DE: K.SARTORI LD: K.SARTORI PIC: PW/TM: L.BAKER LYRON+*OFF=REF*
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Professional Engineer's Name MARK GRAVELDING		
Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by EAB	Drawn by KLS	Checked by HMY

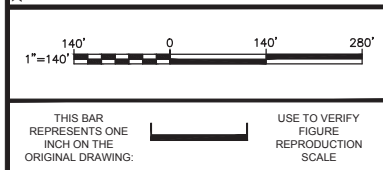


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CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4
SITE DEVELOPMENT PLAN

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Date APRIL 2016
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No.	Date	Revisions	By	Ckd

Professional Engineer's Name MARK GRAVELDING		
Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by EAB	Drawn by KLS	Checked by TK





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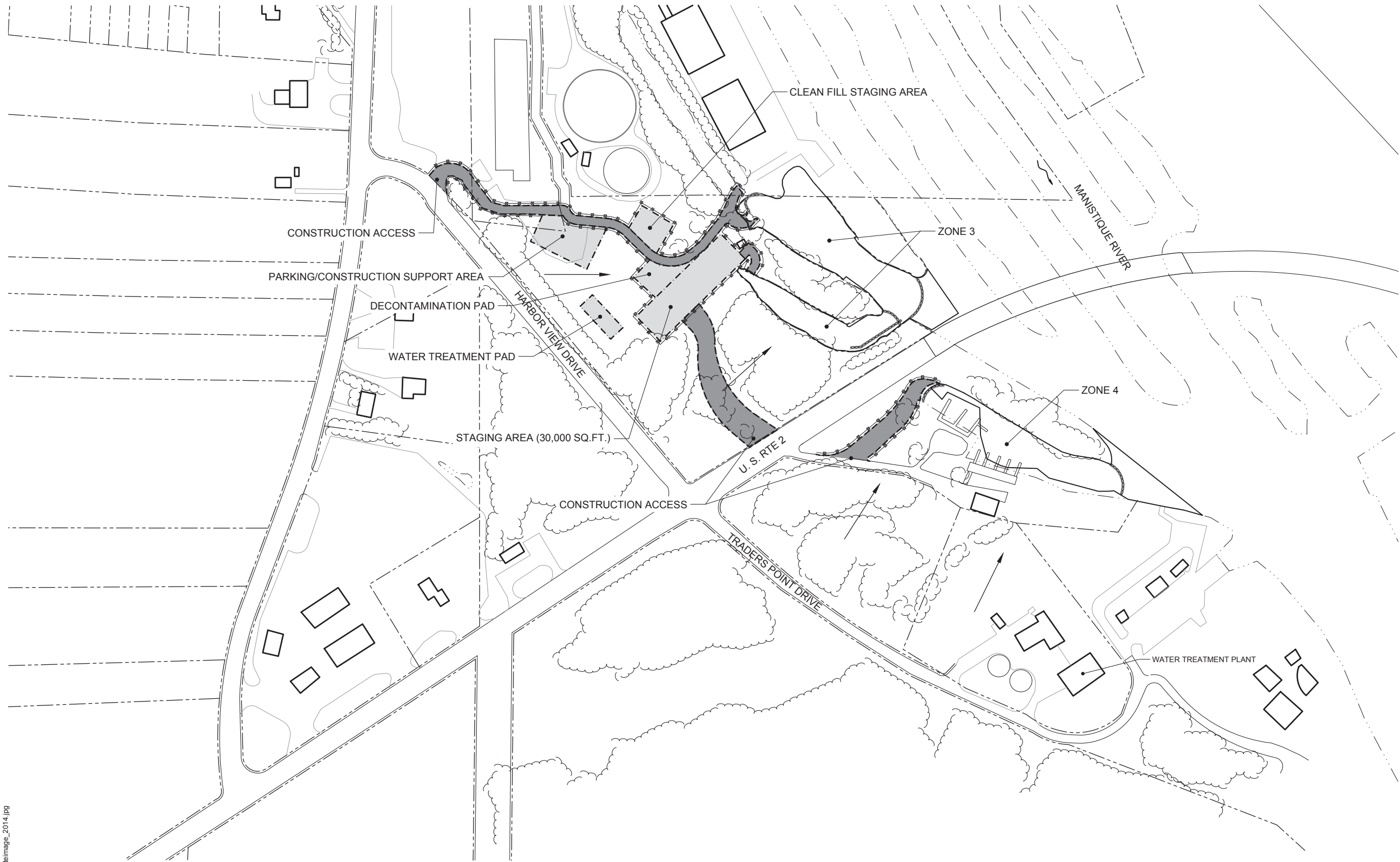
STATE OF MICHIGAN • MANISTIQUE RIVER, SCHOOLCRAFT COUNTY, MI

CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

**TYPICAL LAYOUT - SOIL EROSION
SEDIMENTATION CONTROL PLAN**

ARCADIS Project No. B0038001.0001.0006B
Date APRIL 2016
ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240

3A



LEGEND:

- VEGETATION
- PROPERTY LINE (APPROXIMATE)
- EDGE OF WATER
- SILT FENCE
- TURBIDITY CURTAIN
- STAGING AND SUPPORT AREA
- RUNOFF FLOW DIRECTION
- ACCESS ROADS

- NOTES:**
1. BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEX, GETMAPPING, AEROGRIID,
IGN, IGP, SWISSTOPO, AND THE GIS USER
COMMUNITY.
 2. TYPICAL SITE CONFIGURATION SHOWN.
CONTRACTOR RESPONSIBLE FOR FINAL
LAYOUT FOR ALL SITE FEATURES.
 3. TEMPORARY CONSTRUCTION FENCING TO BE
INSTALLED TO RESTRICT ACCESS TO ALL SITE
FEATURES.
 4. ALL DISTURBED UPLAND AREAS TO BE
RESTORED TO PRE-CONSTRUCTION
CONDITIONS. NO TREES WILL BE REPLACED.

CITY: SYRACUSE, NY DIV: GROUP: ENV/CAD DE: K.SARTORI ID: K.SARTORI PIC: PM/UTM: L.BAKER L.YRON+*OFF=REF*
G:\ENV\CAD\SYRACUSE\ACT\B0038001\0001\000686\DWG\CONTRACT\SESC\B0038001\004.dwg LAYOUT: 4 SAVED: 4/8/2016 11:09 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: LD2B-PDF-LEDGER PLOTSTYLETABLE: PLTCONT.CTB PLOTTED: 4/8/2016 11:09 AM BY: SARTORI, KATHERINE



- LEGEND:
- VEGETATION
 - REMOVAL AREAS
 - TSCA REMOVAL AREAS
 - EXISTING BATHYMETRIC CONTOURS
 - EDGE OF WATER

NOTE:

1. BASE MAP CREATED FROM AERIAL IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRIID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY.

80' 0 80' 160'

1"=80'

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name
MARK GRAVELDING

Professional Engineer's No.
6201059307

State
MI

Date Signed
4/8/2016

Project Mgr.
LMT

Designed by
EAB

Drawn by
KLS

Checked by
HMY

STATE OF MICHIGAN

MARK GRAVELDING

ENGINEER

6201059307

PROFESSIONAL ENGINEER

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ARCADIS OF MICHIGAN, LLC.

STATE OF MICHIGAN • MANISTIQUE RIVER, SCHOOLCRAFT COUNTY, MI

CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS

MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

REMOVAL LIMITS AND DEPTHS

ARCADIS Project No.
B0038001.0001.0006B

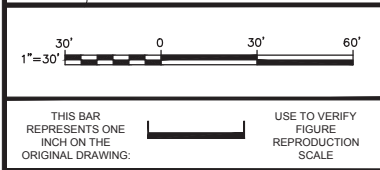
Date
APRIL 2016

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28550 CABOT DRIVE
SUITE 500
NOVI, MI., 48377
TEL. (248) 994.2240

4

CITY: SYRACUSE, NY DIV/GROUP: ENV/CAD DE: K.SARTORI LD: K.SARTORI PIC/PW/TM: L.BAKER LYRON="OFF"=REF*
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Professional Engineer's Name MARK GRAVELDING		
Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by TLC	Drawn by KLS	Checked by HMY





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CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

ZONE 3 DREDGE PRISM CONTOURS

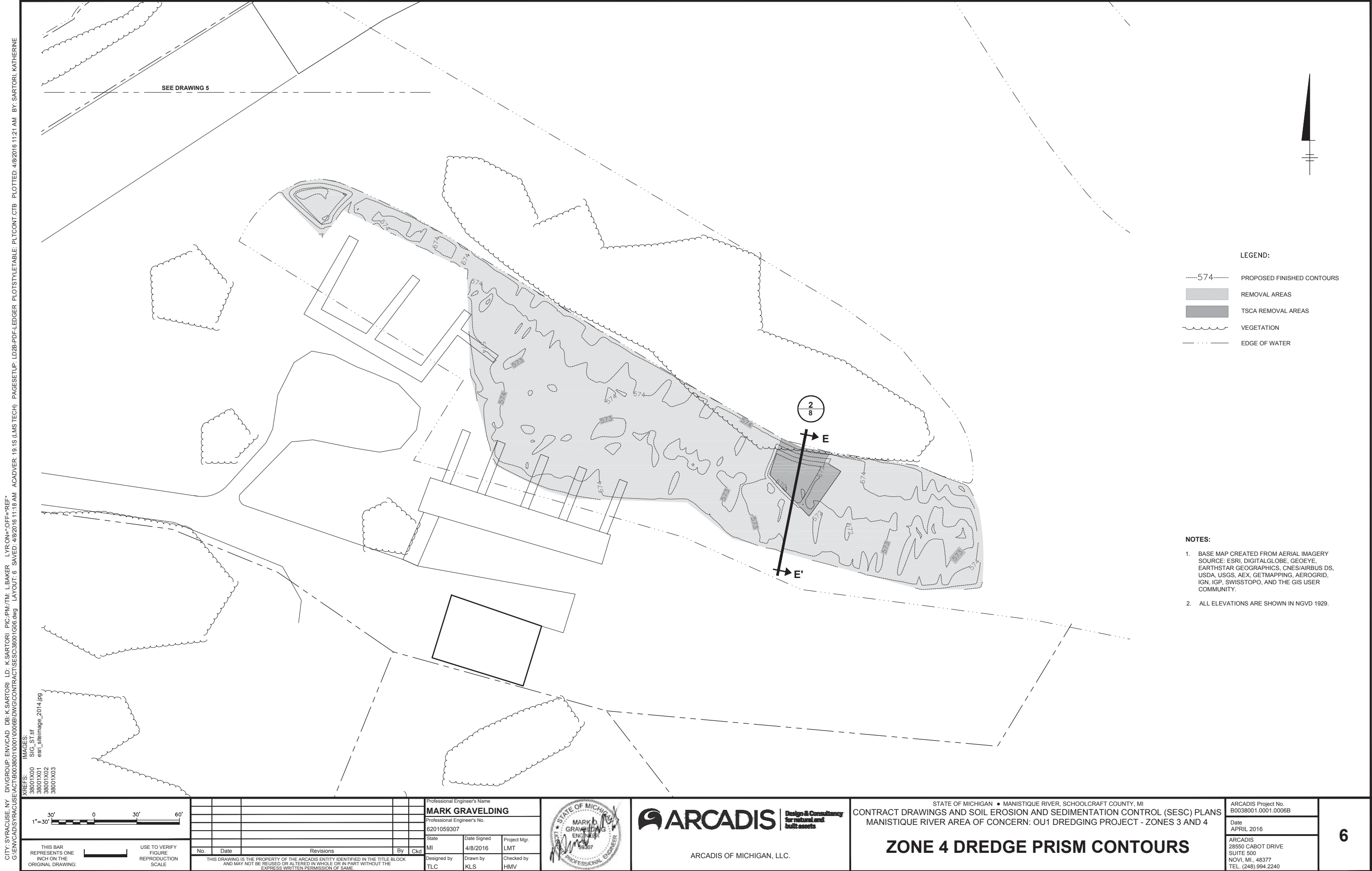
SEE DRAWING 6

ARCADIS Project No. B0038001.0001.0006B
Date APRIL 2016
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- LEGEND:
- 574--- PROPOSED FINISHED CONTOURS
 - REMOVAL AREAS
 - TSCA REMOVAL AREAS
 - VEGETATION
 - EDGE OF WATER

- NOTES:
- BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEX, GETMAPPING, AEROGRID,
IGN, IGP, SWISSTOPO, AND THE GIS USER
COMMUNITY.
 - ALL ELEVATIONS ARE SHOWN IN NGVD 1929.



LEGEND:

- 574--- PROPOSED FINISHED CONTOURS
- REMOVAL AREAS
- TSCA REMOVAL AREAS
- VEGETATION
- EDGE OF WATER

NOTES:

1. BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY.
2. ALL ELEVATIONS ARE SHOWN IN NGVD 1929.

1"=30'

30'

0

30'

60'

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name		
MARK GRAVELDING		
Professional Engineer's No.		
6201059307		
State	Date Signed	Project Mgr.
MI	4/8/2016	LMT
Designed by	Drawn by	Checked by
TLC	KLS	HMV



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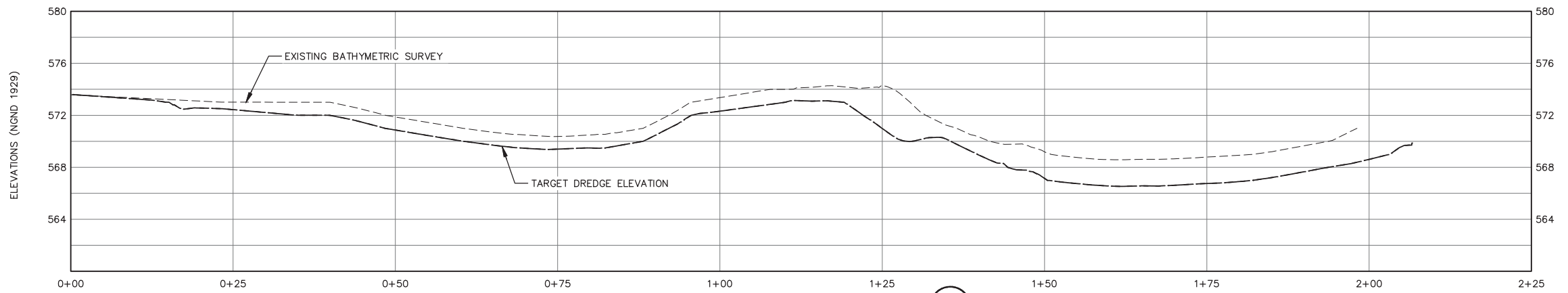
CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS

MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

ZONE 4 DREDGE PRISM CONTOURS

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Date APRIL 2016
ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240

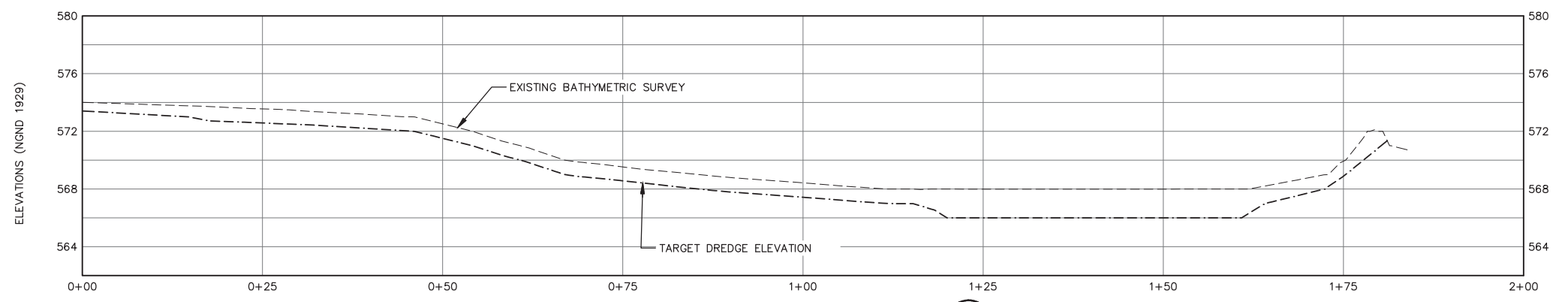
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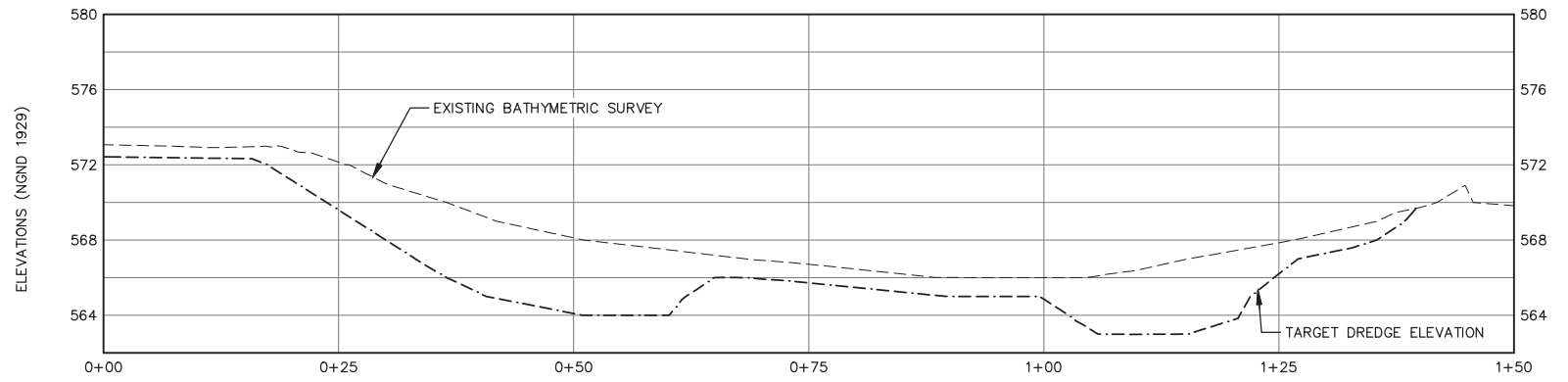
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CROSS SECTION B-B' 2

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HORIZONTAL SCALE: 1"=10'

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VERTICAL SCALE: 1"=4'



CROSS SECTION C-C' 3

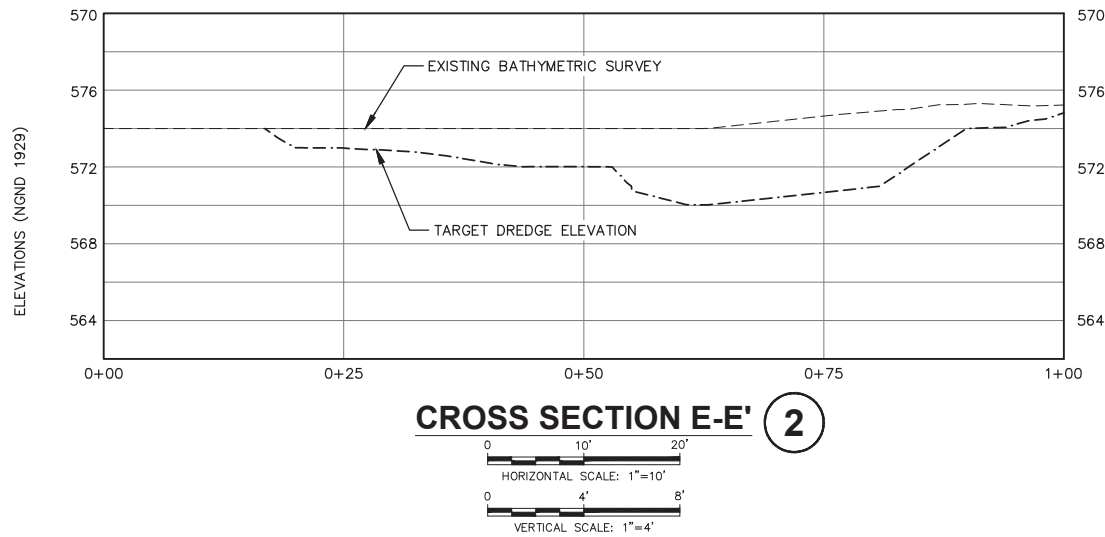
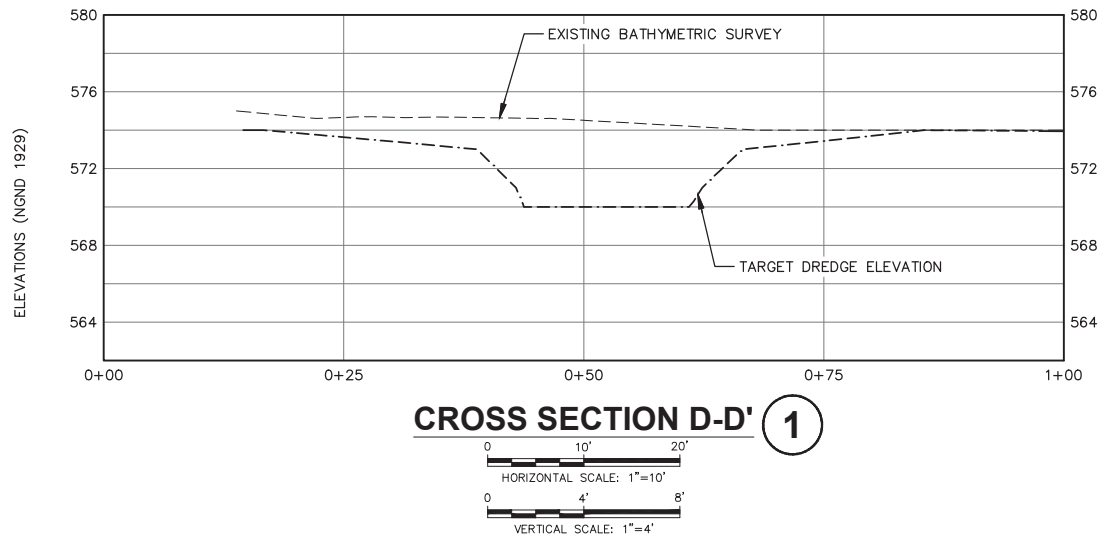
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VERTICAL SCALE: 1"=4'

NOTE:
1. ALL ELEVATIONS ARE SHOWN IN NGVD 1929.

SCALE(S) AS INDICATED										Professional Engineer's Name MARK GRAVELDING			 ARCADIS OF MICHIGAN, LLC.	STATE OF MICHIGAN • MANISTIQUE RIVER, SCHOOLCRAFT COUNTY, MI CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4		ARCADIS Project No. B0038001.0001.0006B		7	
										Professional Engineer's No. 6201059307				Date APRIL 2016					
										State MI				Checked by HMV		ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240			
										Date Signed 4/8/2016				Project Mgr. LMT					
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NOTE:
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Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
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CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

CROSS SECTIONS

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Professional Engineer's Name		
MARK GRAVELDING		
Professional Engineer's No.		
6201059307		
State	Date Signed	Project Mgr.
MI	4/8/2016	LMT
Designed by	Drawn by	Checked by
TLC	KLS	HMV



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ARCADIS OF MICHIGAN, LLC.

STATE OF MICHIGAN • MANISTIQUE RIVER, SCHOOLCRAFT COUNTY, MI

CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

ZONE 3 DREDGE MANAGEMENT UNITS

ARCADIS Project No. B0038001.0001.0006B
Date APRIL 2016
ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240



LEGEND:

DREDGE MANAGEMENT UNIT

TSCA DREDGE MANAGEMENT UNIT

PRELIMINARY CONFIRMATION SAMPLE LOCATIONS

VEGETATION

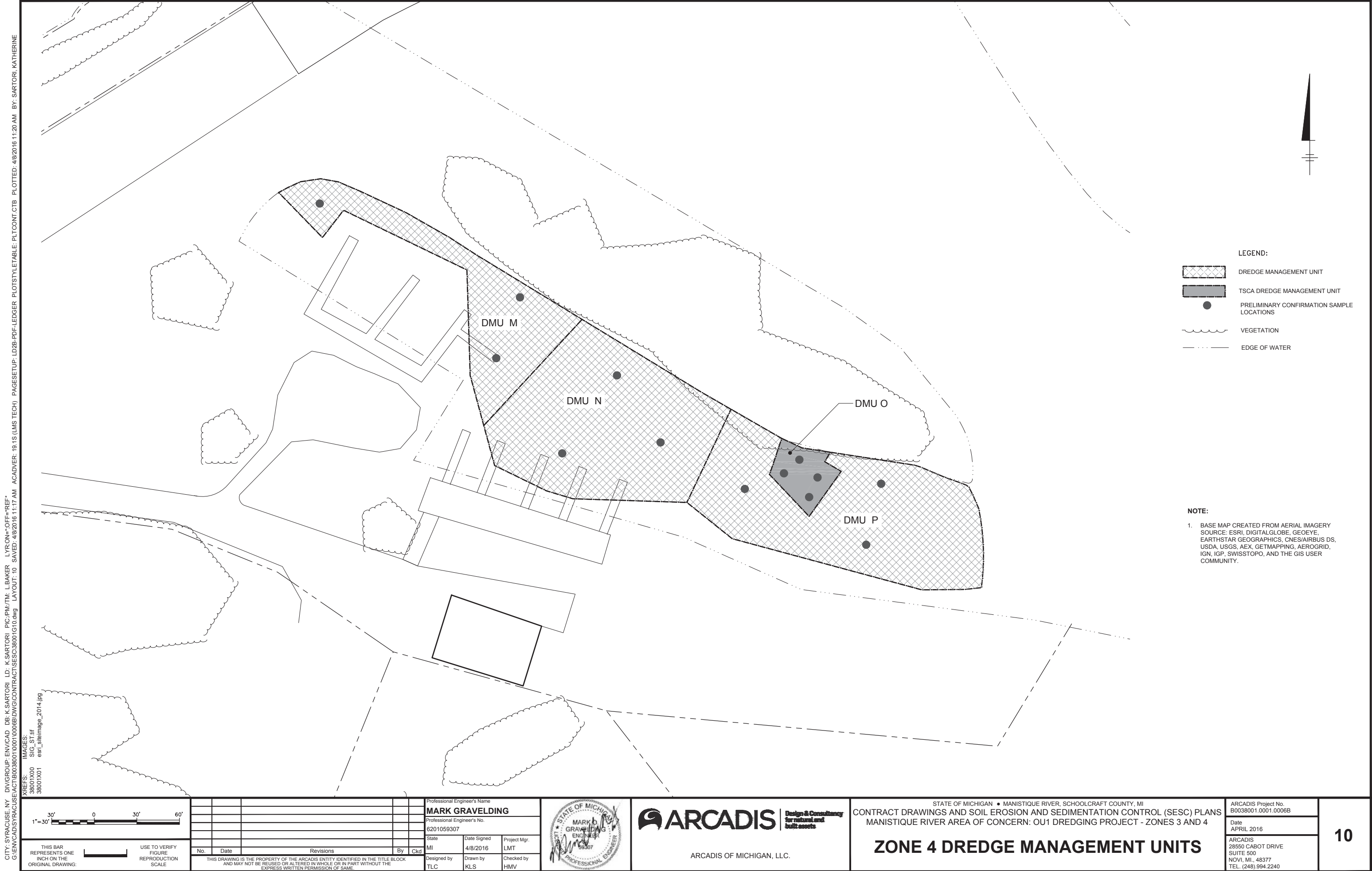
EDGE OF WATER

- NOTES:
1.

BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEX, GETMAPPING, AEROGRIID,
IGN, IGP, SWISSTOPO, AND THE GIS USER
COMMUNITY.
2.

NO CONFIRMATION SAMPLING WILL BE
CONDUCTED IN DMU A. DMU A WILL HAVE
2-FEET OF MATERIAL REMOVED AND 1-FOOT
OF COVER PLACED.
3.

DUE TO THE DEPTH OF CONTAMINATION, AND
THE SLOPE STABILITY DIFFICULTIES
ASSOCIATED WITH THE REMOVAL OF 7 FEET
OF MATERIAL DIRECTLY ADJACENT TO THE
BANK, A RISK-BASED APPROVAL WAS
RECEIVED TO LEAVE THE TSCA MATERIAL IN
PLACE AND PERFORM LIMITED REMOVAL AND
BACKFILL IN DMU A.



CITY: SYRACUSE, NY DIV/GROUP: ENV/CAD DE: K.SARTORI LD: K.SARTORI PIC/PW/TM: L.BAKER LYRON+*OFF=REF*
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Professional Engineer's Name
MARK GRAVELDING

Professional Engineer's No.
6201059307

State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by TLC	Drawn by KLS	Checked by HMY

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CONTRACT DRAWINGS AND SOIL EROSION AND SEDIMENTATION CONTROL (SESC) PLANS
MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

ZONE 4 DREDGE MANAGEMENT UNITS

ARCADIS Project No.
B0038001.0001.0006B

Date
APRIL 2016

ARCADIS
28550 CABOT DRIVE
SUITE 500
NOVI, MI., 48377
TEL: (248) 994.2240

10

APPENDIX D

Dredging Slope Stability Calculations



State of Michigan Department of Technology, Management and Budget

Manistique River Area of Concern Dredging Slope Stability Calculations

Analyses:

Attachment A – Plan View of Cross Section Geometry

Attachment B – Boring Log Location Map and Boring Logs

Attachment C - Slope/W Stability Output Results

03.23.2016

Client: State of Michigan Department of Technology, Management and Budget

Project: B0043025.0015

Prepared by: Kyle Warren

Date: March 2016

Title: Manistique River Area of Concern Dredging Slope Stability Calculations

Reviewed By: Adam Chwalibog

Date: March 2016

Subject: Slope Stability of Bank Slopes Associated with Removal near ST01U

OBJECTIVE: Evaluate three critical sections of the proposed dredge prism for stability in the area surrounding core location ST10U.

REFERENCES:

1. Das, Braja M. *Principles of Geotechnical Engineering: Sixth Edition*. Thompson. Toronto, Canada. 2006.
2. Geo-Slope International Ltd, 2010. *Slope/W (2010)*.
3. "Manistique." 45°57'N and 86°15'W. *Google Earth*. May 15, 2013. January 15, 2016.
4. Lambe, T. William and Whitman, Robert V. *Series in Soil Engineering: Soil Mechanics*. John Wiley & Sons. New York City, New York. 1969.

ATTACHMENTS:

- A. Plan View of Cross Section Geometry
- B. Boring Log Location Map and Boring Logs
- C. Slope/W Stability Output Results

ASSUMPTIONS:

1. Water depth is shallower near the bank and up to 10 feet towards the center of the channel. For the models, river water is at El. 571 and El. 573 ft NGVD29. Ground water is at El. 573 ft NGVD29.

2. The geometry of the cross sections is based on the bathymetric survey performed in October 2015 by Aqua Survey, Inc (ASI) and proposed dredging depths from existing sediment surface. Due to stability concerns associated with a 7 foot removal, a risk-based approval has been received to leave the TSCA material at 7 feet based on discussions with the Project Partners. In this area, 2 feet of material will be removed and disposed of as non-TSCA material. Transition slopes between dredge prisms are 2(horizontal):1(vertical). The shoreline slopes are assumed to extend from the edge of shoreline to 2 feet below sediment surface (bss). Slopes from the shoreline will be approximately a 3(horizontal):1(vertical) or shallower from each shoreline. Plan view can be found in Attachment A.
3. Existing soils/sediments are conservatively assumed to be layers of silt and sand, and sand underlain by shallow bedrock. Boring logs from the in-water borings performed by Arcadis in October 2015 indicated bedrock to be between 4.7 and 13.7 ft below sediment surface. Boring location map and boring logs can be found in Attachment B.
4. Soil classification and parameters used for stability calculations design were assigned using geotechnical soil boring information collected in October 2015. Soil and sediment parameters were assumed using Das typical values (Reference 1).
5. The soil parameters used in the stability calculations can be found in Table 1. These parameters were assigned using typical values and boring log soil classifications. Bedrock modeled as impenetrable.

Table 1: Soil Parameters

Type of Soil	Moist Unit Weight, γ_m (pcf)	Internal friction angle, ϕ (deg)
Silt and Sand	95	30
Sand	110	32

Notes:

pcf = pounds per cubic foot

deg = degrees

psf = pounds per square foot

6. All elevations referenced in this calculation are based on National Geodetic Vertical Datum 1929 (NGVD29).
7. Stability and surface failure planes were analyzed using the GeoSlope International Computer Program Slope/W (Reference 2) to determine an adequate Factor of Safety (FOS).
8. Rankine's theory of lateral active earth pressure was used for the stability design.

9. It is assumed the land-ward shoreline slope elevation increases from the edge of the bathymetry data at a 2.5(horizontal):1 (vertical) on average for the modeling. This is based on Google Earth (Reference 3) elevation profiles and shoreline reconnaissance photos.
10. Stability was analyzed to determine adequate FOS values for the 3 critical sections within Zone 3. The critical areas for the Site are assumed to be in the north east area of Zone 3. Critical sections include the eastern shoreline, western shoreline and northern shoreline. Sections plan view can be found in Attachment A. The minimum acceptable FOS values for the dredging conditions is assumed to be 1.5.
11. It is assumed the sand and silt and sand materials will have an angle of repose ranging from 30° to 36° (Reference 4).

CALCULATIONS:

The stability analysis for the proposed post-excavation surfaces in the critical areas of Zone 3 was performed using the Slope/W computer program by Geo Studio International (Reference 2). Slope/W requires soils properties and soil strata to be input, and then determines slope/failure surfaces with the lowest safety factor based on force equilibrium. The model outputs for stability of the proposed dredging can be found in Attachment C. The FOS results can be found in Table 2 below. As stated in the assumptions, additional models were evaluated using a range of potential soil parameters and river water elevations.

Using the design criteria listed in the assumptions section, the following FOS have been calculated using Slope/W:

Table 2: Sections and Factor of Safety

Section	FOS
Section North South	2.195
Section East West (West Shoreline)	1.764
Section East West (East Shoreline)	1.922

CONCLUSIONS:

Based on the assumptions stated above, the proposed critical dredging areas and slopes in Attachment A and anticipated soil parameters for the conditions are acceptable to resist global failure. The recommended 3(horizontal):1(vertical) transition between shoreline and bottom of

excavation will have a FOS of at least 1.5 during dredging in the critical dredging area.

For areas other than the TSCA PCB exceedance area in the northeast corner of Zone 3, alternative slope stability was considered. Based on the angle of repose range from 30° to 36° (Reference 3) of the native materials found in the borings, a stable slope would range between 1.5(horizontal):1(vertical) and 2(horizontal):1(vertical) based on the geotechnical borings and assumed soil parameters. Therefore, a maximum 2(horizontal):1(vertical) slope between dredge prisms is recommended. A maximum 3(horizontal):1(vertical) slope along the shoreline to dredge prisms is recommended.

ATTACHMENT A

Plan View of Cross Section Geometry



CITY: SYRACUSE, NY DIV/GROUP: ENV/CAD DE: K.SARTORI LD: K.SARTORI PIC/PW/TM: L.BAKER LYRON="OFF"=REF*
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Professional Engineer's Name MARK GRAVELDING		
Professional Engineer's No. 6201059307		
State MI	Date Signed 4/8/2016	Project Mgr. LMT
Designed by TLC	Drawn by KLS	Checked by HMY



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MANISTIQUE RIVER AREA OF CONCERN: OU1 DREDGING PROJECT - ZONES 3 AND 4

SEE DRAWING 6

ZONE 3 DREDGE PRISM CONTOURS

ARCADIS Project No. B0038001.0001.0006B
Date APRIL 2016
ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MI., 48377 TEL. (248) 994.2240



- LEGEND:
- 574--- PROPOSED FINISHED CONTOURS
 - REMOVAL AREAS
 - TSCA REMOVAL AREAS
 - VEGETATION
 - EDGE OF WATER

- NOTES:
- BASE MAP CREATED FROM AERIAL IMAGERY
SOURCE: ESRI, DIGITAL GLOBE, GEOEYE,
EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS,
USDA, USGS, AEX, GETMAPPING, AEROGRIID,
IGN, IGP, SWISSTOPO, AND THE GIS USER
COMMUNITY.
 - ALL ELEVATIONS ARE SHOWN IN NGVD 1929.


ATTACHMENT B

Boring Log Location Map and Boring Logs





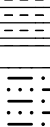




Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427936.103 Easting: 26436588.275 Borehole Depth: 13 feet bss Water Depth: 10 feet Sediment Elevation: 571.008 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B01 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <h1>DRAFT</h1>
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DEPTH	ELEVATION (ft NGOD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	570	1	0-2	4.5	WOR WOR 1 1	1			Black very fine SAND and SILT, trace Organics, well sorted, very loose, wet.	
					WOH WOH 1 1				Grayish-brown small to large subround to subangular GRAVEL, little Silt, little fine to medium Sand, poorly sorted, very loose, wet.	
		2	2-4	10.5	WOH WOH WOH WOH	WOH			Gray Organic SILT, trace Clay, trace fine subround Sand, trace Organics, high plasticity, rapid dilatancy, very loose, wet.	
									Brown Silt and Clay seam, high plasticity, slow dilatancy at 3.7 feet bss.	
5		3	4-6	7.0	WOH WOH 2 2	2			Brown fine subround to subangular SAND, well sorted, dense, wet.	
	565								Trace small Pebbles between 6.0 and 6.1 feet bss.	
		4	6-7	6.0	3 5 3 3	8			Dark grayish-brown WOOD.	
10	560	R-1	8-13	38.0	NA	48%			Rock core conducted from 8.0 to 13.0 feet bss. Brown SILTSTONE, moderately fractured, slightly to moderately weathered. Average coring time: 5:28 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
15									End of boring at 13 feet bss.	

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.


Date Start/Finish: 10/8/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427863.816 Easting: 26436561.385 Borehole Depth: 15 feet bss Water Depth: 6.5 feet Sediment Elevation: 574.465 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B02 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION (ft NGCD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
575										
0		1	0-2	NR	1 1 2	2			NO RECOVERY.	
		2	2-4	6.5	3 3 2 2	5			Dark brown fine to medium subround to subangular SAND and WOOD, little Silt, trace small subround Pebbles, poorly sorted, loose, wet.	
570		3	4-6	NR	1 1 1 2	2			NO RECOVERY.	
5		4	6-8	17.0	1 1 1 1	2			Brown fine to medium subround to subangular SAND, little Silt, trace Clay, poorly sorted, very loose, wet.	
		5	8-9.7	21.0	WOH WOR WOH 50/3"	WOH			Light brown CLAY, trace Silt, no dilatancy, soft, high plasticity, wet. Silt parting at 6.75 feet bss. Silt parting at 7.25 feet bss. Silt seam at 7.6 feet bss.	
565									Light brown CLAY and SILT, little fine to medium subround to subangular Sand, slow dilatancy, low plasticity, very soft, wet.	
10									Refusal at 9.9 feet bss due to sedimentary Rock.	
		R-1	10-15	47.5	NA	22%			Rock core conducted from 10 to 15 feet bss. Brown and gray SILTSTONE, highly fractured, moderately to heavily weathered. Average coring time: 8:00 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
560										
15									End of boring at 15 feet bss.	

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
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Date Start/Finish: 10/8/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427860.139 Easting: 26436667.759 Borehole Depth: 11.8 feet bss Water Depth: 10.1 feet Sediment Elevation: 572.614 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B03 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION (ft NGOD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
575										
0										
		S-1	0-2	NR	WOR WOR WOH WOH	0			NO RECOVERY.	
570										
		S-2	2-4	NR	WOR WOR WOR WOR	0			NO RECOVERY.	
5		S-3	4-6	11	WOR WOR WOH WOH	0			Brown fine to coarse subround to subangular SAND, trace Silt, poorly sorted, loose, wet. Chunks of wood.	
									Brown CLAY and SILT, little fine Sand, medium plasticity, slow dilatancy, verysoft, wet.	
		S-4	6-6.8	10	WOR WOH/3'	NA			Brown fine to medium subround to subangular SAND, little Clay, some Silt, medium plasticity, poorly sorted, wet.	
									Angular pieces of SILTSTONE, trace Silt.	
565										
10		R-1	6.8-11.8	53	NA NA NA NA	68%			Rock core conducted from 6.8 to 11.8 feet bss. Brown SILTSTONE, slightly fractured, slightly weathered. No fractures, non-weathered 9.8 to 11.8 feet bss. Average coring time: 6:09 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
560									End of boring at 11.8 feet bss.	
15										




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Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.


Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427789.901 Easting: 26436497.719 Borehole Depth: 15.5 feet bss Water Depth: 4.5 feet Sediment Elevation: 573.222 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B04 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION (ft NGVD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
575										
0		1	0-2	7.5	1 WOH WOH WOH	WOH			Grayish-brown fine to medium subround to subangular SAND, trace Silt, poorly sorted, very loose, wet. Organics (twigs, leaves), trace Gravel at 0.0 feet bss. Wood at 1.0 feet bss. Wood at 2.0 feet bss.	
570		2	2-4	0.0	1 WOH WOH 1	WOH			NO RECOVERY. WOOD Debris.	
5		3	4-6	2.0	WOR WOH WOH WOH	WOH			Black/brown trace fine to medium subround to subangular SAND and WOOD, very loose, wet.	
		4	6-8	9.0	WOH WOH 1 1	1			Black/grayish-brown very fine subround SAND and WOOD, some Silt, trace medium Sand to granular, poorly sorted, very loose, wet.	
									Light brown fine round to subround SAND, well sorted, very loose, wet.	
									WOOD filler (shavings), trace small Pebbles, very loose, wet.	
565		5	8-10	7.5	5 6 10 7	16			Light brown fine to medium subround to subangular SAND, trace Gravel, poorly sorted, medium dense, wet.	
10		6	10-10.2	2.0	50/2"	NA				
560		R-1	10.5-15.5	57.0	NA	23%			Rock core conducted from 10 to 15 feet bss. Light brown SILTSTONE, moderately to highly fractured, moderately weathered. Average coring time: 5:48 minutes per foot.	Borehole backfilled with Bentonite to sediment surface
15										
									End of boring at 15.5 feet bss.	

 <div style="display: inline-block; vertical-align: middle; font-size: 0.8em;"> Design & Consultancy for natural and built assets </div>	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
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Date Start/Finish: 10/9/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427668.920 Easting: 26436695.103 Borehole Depth: 13.3 feet bss Water Depth: 10 feet Sediment Elevation: 572.370 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B05 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <h1>DRAFT</h1>
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DEPTH	ELEVATION (ft NGOD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
575										
0		1	0-2	4.0	WOR WOR WOH WOH	WOH			WOOD, black/dark brown fine to medium subround to subangular SAND, little Silt, poorly sorted, very loose, wet.	
570		2	2-4	6.5	WOH 5 10 3	15	X		Dark brown fine to medium subround to subangular SAND, little Silt, trace Organics (small twigs), well sorted, medium dense, wet.	
									WOOD, dark brown fine to medium subround to subangular Sand, little Silt, trace Organics (small twigs), well sorted, medium dense, wet.	
5		3	4-6	9.0	WOH 3 5 5	8	X		Grayish-brown fine to medium round to subround SAND and SILT, well sorted, loose, nonplastic, wet.	
									Medium to large subround to subangular Gravel from 5.7 to 6.0 feet bgs.	
565		4	6-8	15.0	1 5 3 3	8			Grayish-brown fine to coarse subround to subangular SAND, little granules to small subround to subangular Gravel, trace Silt, poorly sorted, loose, wet.	
									Brown SILT and CLAY, little fine Sand, slow dilatancy, medium plasticity, very soft, wet.	
10		5	8-10	24.0	WOH 1 1 2	2	X		Brown fine SAND and SILT, non-plastic, very loose, wet.	
									Brown very fine round SAND, trace Silt, well sorted, medium dense, wet.	
		6	10-12	24.0	WOH 1 2 4	3	X		Brown SILT, some fine to medium Sand, trace Clay, rapid dilatancy, medium plasticity, wet.	
560									Gray small to very large subround to angular GRAVEL, little coarse subround to angular Sand to granules, trace Silt, poorly sorted, very dense, wet.	
		7	12-13.3	10.0	9 13 50/3"	50+			LIMESTONE/SILTSTONE. Bedrock at 13.0 feet bss.	
									Refusal at 13.3 feet bss. End of boring at 13.3 feet bss.	
15										

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
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Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427499.442 Easting: 26436644.989 Borehole Depth: 13.9 feet bss Water Depth: 4.5 feet Sediment Elevation: 574.991 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B06 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION (ft NGOD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	575	1	0-2	0.0	WOR WOR WOH WOH	WOH			NO RECOVERY.	
		2	2-4	0.0	WOH WOH WOH WOH	WOH				
5	570	3	4-6	2.0	WOH WOH WOH 2	WOH			Gray fine to medium round to subround SAND and WOOD, trace Silt, well sorted, medium dense, wet.	
		4	6-8	19.0	6 7 6 7	13	X		Gray SANDY SILT, nonplastic, dense, wet. Wood from 6.0 to 6.1 feet bss. Gravel and Pebbles from 6.5 to 6.7 feet bss.	
		5	8-10	24.0	1 WOH 1 WOH	1	X		Brown CLAY and SILT, little fine Sand, trace Gravel, low plasticity, slow dilatancy, very soft, wet.	
10	565	6	10-12	16.0	1 1 1 3	2			Very fine Sand and Silt seam at 10.0 to 10.1 feet bss.	
		7	12-13.9	24.0	9 13 10 50/3"	23	X		Brown SANDY CLAY, some fine subrounded to angular Gravel, few Silt, low plasticity, wet. Brown CLAY and SILT, little fine Sand, trace Gravel, low plasticity, slow dilatancy, very soft, wet.	
15	560								Sedimentary rock (possible SILTSTONE). Bedrock at 13.7 feet bss. Refusal at 13.9 feet bss. End of boring at 13.9 feet bss.	Borehole backfilled with Bentonite to sediment surface



 <div>Design & Consultancy for natural and built assets</div>	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
	<div>Project Number: B0038001.0001 Template: G:\Rockware\LogPlot 2001\LogFiles\Templates\2007 Templates\boring_well HSA 2007 analytical.ldfx</div> <div>Data File: AUS-B06.dat Date: 1/6/2016 Created/Edited by: APG Page: 1 of 1</div>


Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427347.923 Easting: 26436983.484 Borehole Depth: 12.8 feet bss Water Depth: 3.5 feet Sediment Elevation: 576.107 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B07 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <h1>DRAFT</h1>
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DEPTH	ELEVATION (ft NGCD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0										
57.5		1	0-2	7.0	WOH WOH 1	1			Black fine to medium subround to aubangular SAND, little Silt, well sorted, very loose, wet. Some Organics from 0.0 to 1.0 feet bss. Grayish brown to brown, trace Organics from 1.0 to 3.3 feet bss.	
		2	2-4	8.0	WOH WOH WOH WOH	WOH	X		Brown, trace Silt, dense. Grayish brown. Some Wood from 4.0 to 4.2 feet bss. Trace wood shavings from 4.2 to 8.0 feet bss.	
5		3	4-6	13.0	1 2 WOH WOH	2	X			
57.0		4	6-8	4.0	WOH WOH WOH WOH	WOH				
		5	8-10	15.0	WOH WOH 1 12	1			Trace Wood shavings	
10									Apparent COBBLE.	
56.5		6	10-12	18.0	1 3 10 4	13	X		Brown fine to medium subround SAND, well sorted, medium dense, wet.	
		7	12-12.8	8.0	21 50/2"	NA	X		Brown fine to medium subround to subangular SAND and small to large subround to angular GRAVEL, poorly sorted, medium dense, wet. Brown SILTY fine subrounded to subangular SAND, little Clay, little Gravel, low plasticity, rapid dilatancy, poorly sorted, dense, wet.	
									Refusal at 12.8 feet bss. End of boring at 12.8 feet bss.	
15										

	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
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Date Start/Finish: 10/10/2015 Drilling Company: Atlantic Testing Laboratories, Inc. Driller's Name: Brad Perry Drilling Method: Wet Rotary Auger Size: 4" Rig Type: CME45 Sampling Method: 2" x 2' Split Spoon	Northing: 427163.837 Easting: 26437325.104 Borehole Depth: 4.7 feet bss Water Depth: 5.2 feet Sediment Elevation: 575.041 feet Descriptions By: A. Robinson	Well/Boring ID: AUS-B08 Client: Michigan Department of Technology, Management, and Budget Location: Manistique, MI <div style="font-size: 2em; font-weight: bold; text-align: center;">DRAFT</div>
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DEPTH	ELEVATION (ft NGOD29)	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N - Value/RQD %	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	575	1	0-2	4.0	WOH WOH WOH WOH	WOH			Black very fine to fine round to subround SAND, some Silt, trace Wood/Organics, well sorted, very loose, wet. Grayish brown, little Silt from 1.0 to 2.0 feet bss.	
		2	2-4	0.0	WOH WOH WOH WOH	WOH		NO RECOVERY.		
		3	4-4.7	0.0	WOR 50/1"	NA				
5	570								Refusal at 4.7 feet bss. End of boring at 4.7 feet bss.	
10	565									
15	560									

 <div>Design & Consultancy for natural and built assets</div>	Remarks: bss = below sediment surface; NA = not applicable/available; NR = no recovery; WOH = weight of hammer; WOR = weight of rod.
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ATTACHMENT C

Slope/W Stability Output Results



Name: North-South Stability

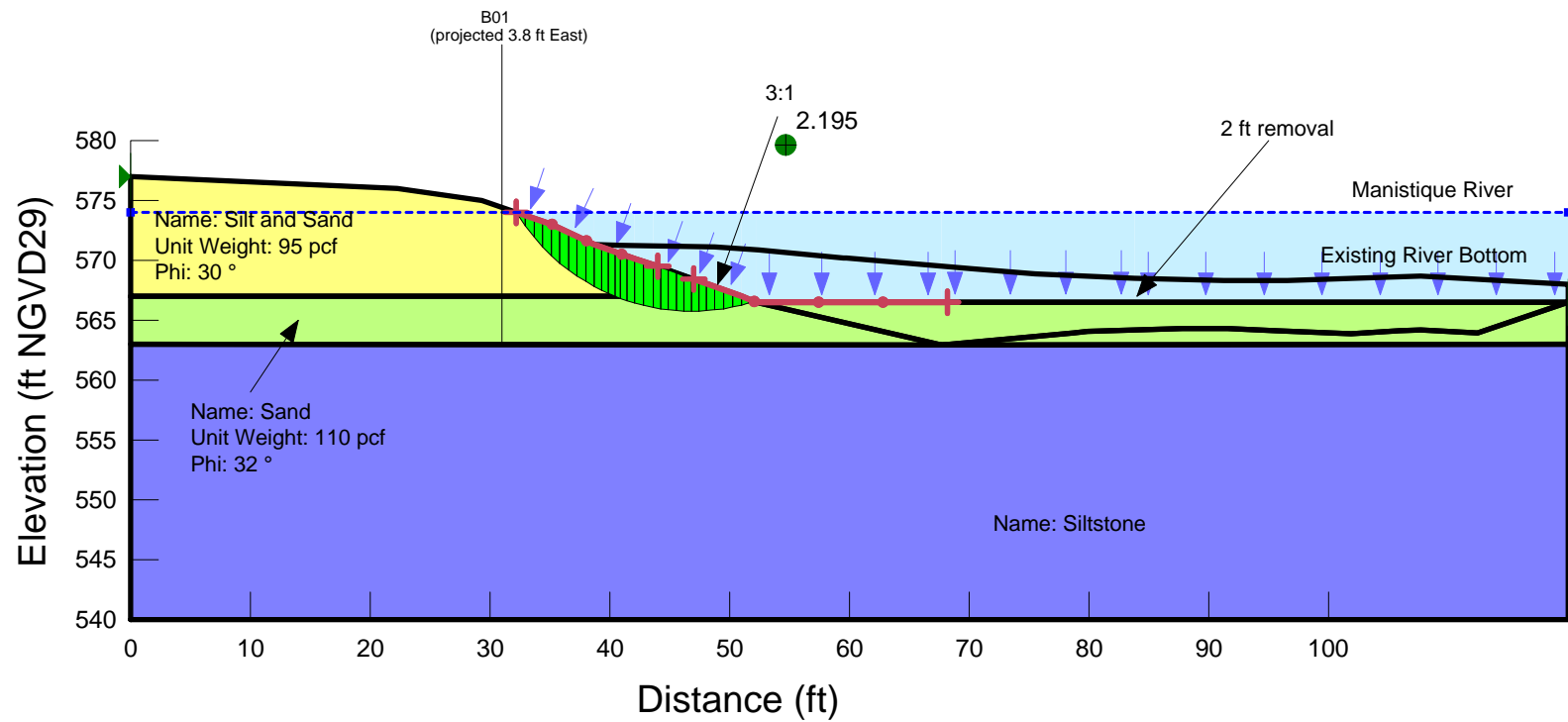
Date: 3/3/2016

Time: 3:28:54 PM

Method: Spencer

Slip Surface Option: Entry and Exit

Direction of movement: Left to Right



File Name: Manistique_East to West_2 ft removal.gsz

Name: West to East (Left to Right)

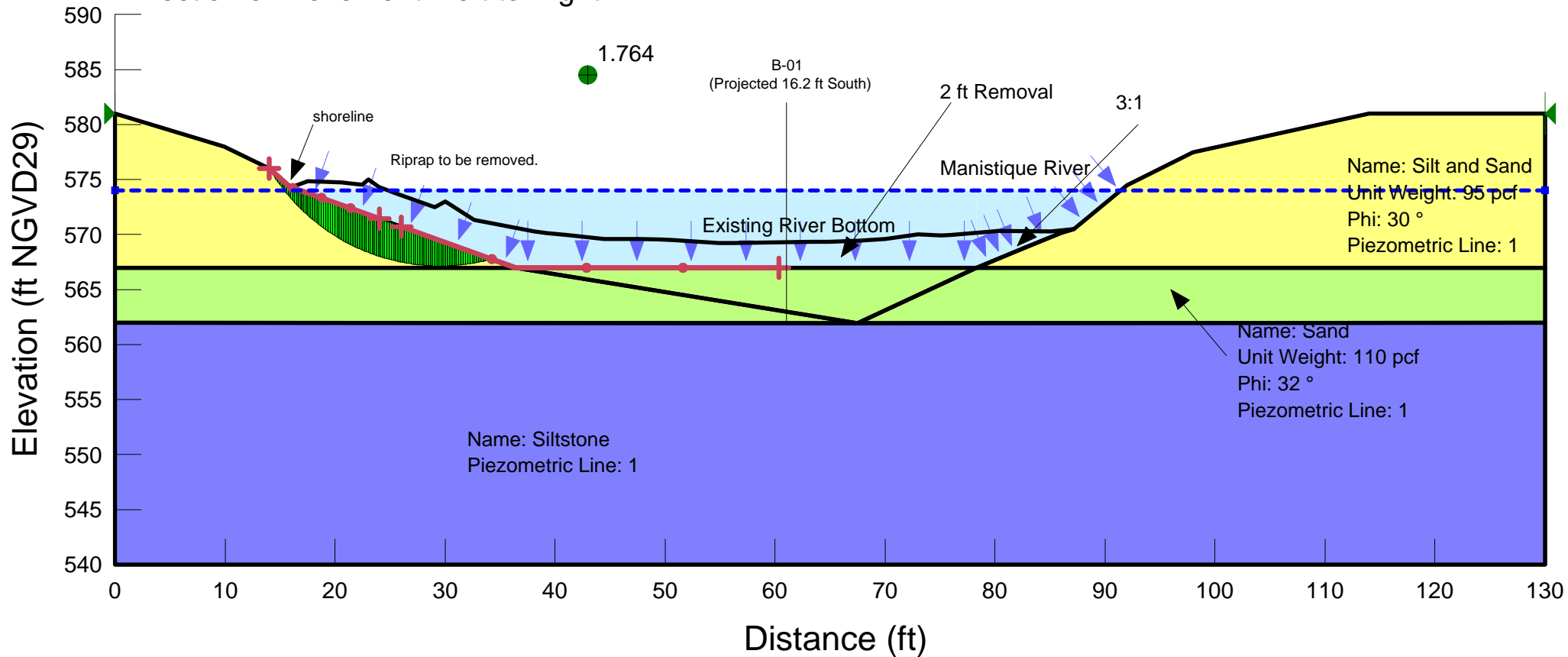
Date: 3/4/2016

Time: 11:17:33 AM

Method: Spencer

Slip Surface Option: Entry and Exit

Direction of movement: Left to Right



File Name: Manistique_East to West_2 ft removal.gsz

Name: West to East (Right to Left)

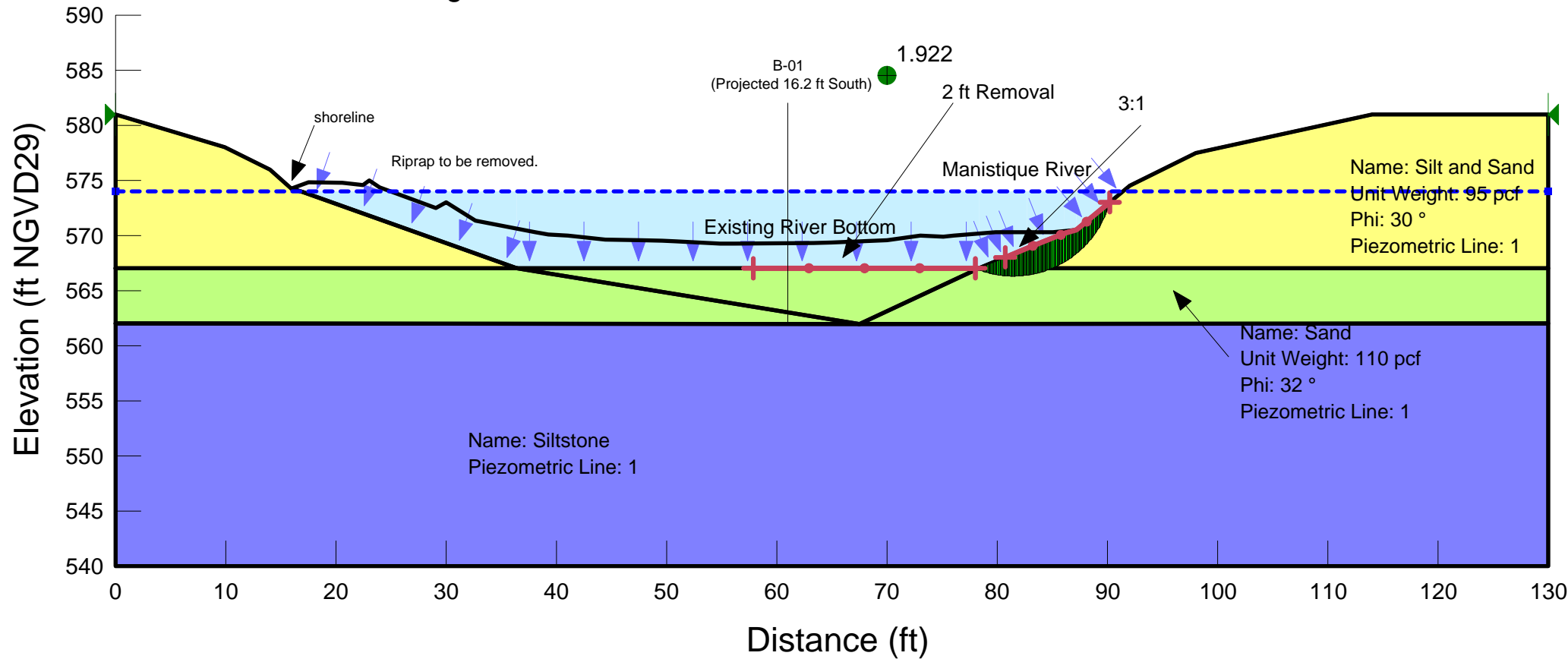
Date: 3/3/2016

Time: 2:59:52 PM

Method: Spencer

Slip Surface Option: Entry and Exit

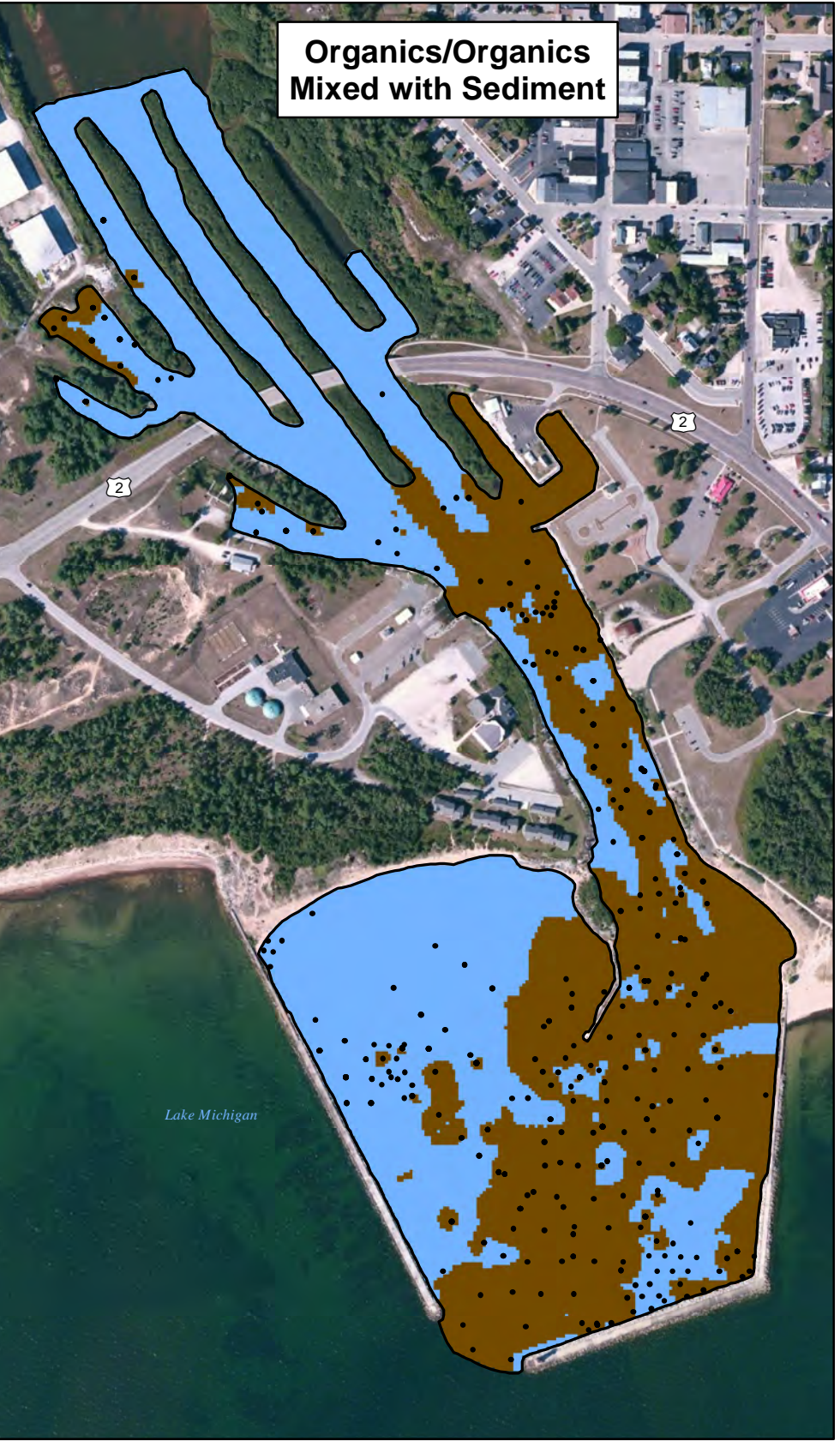
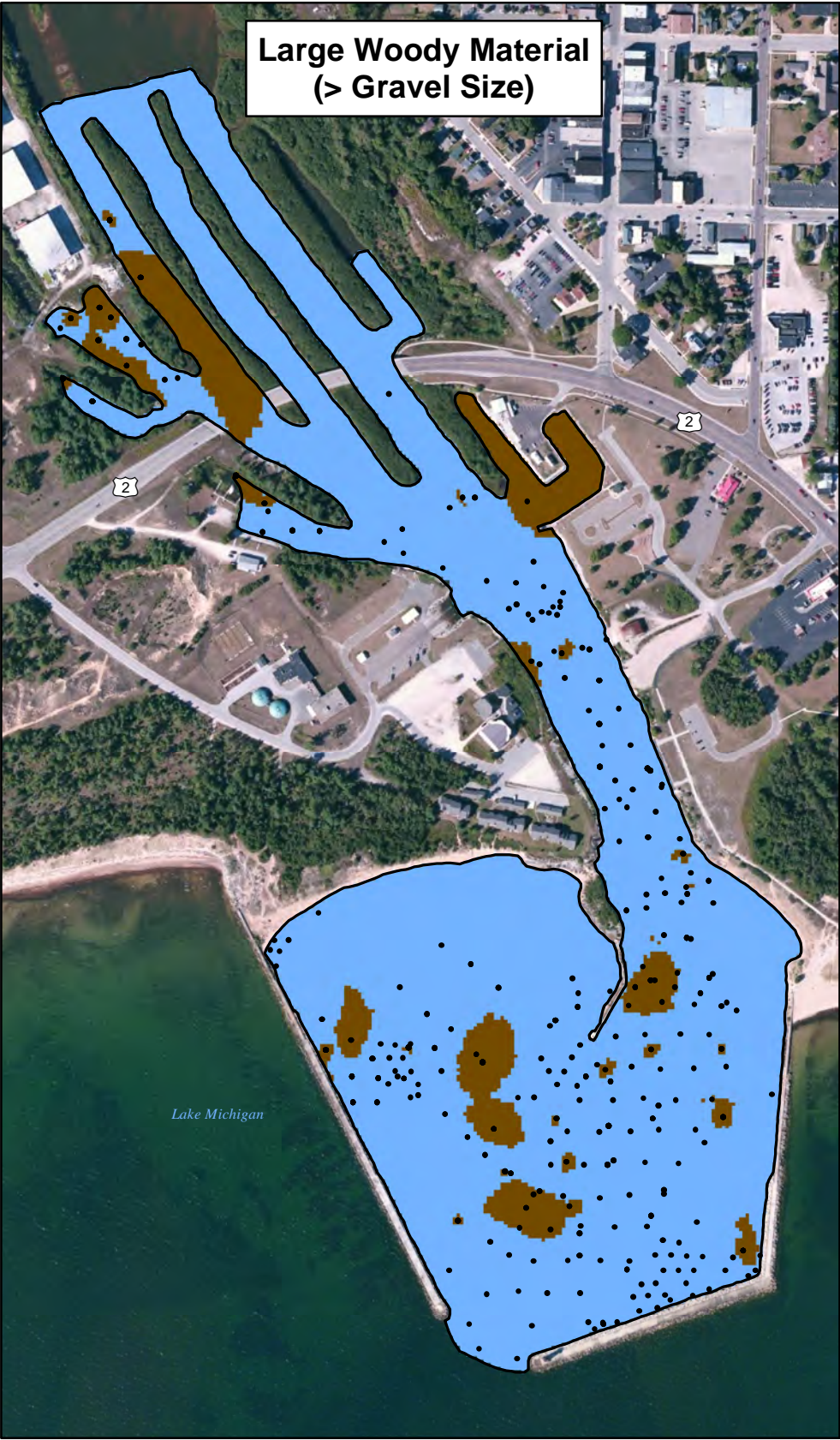
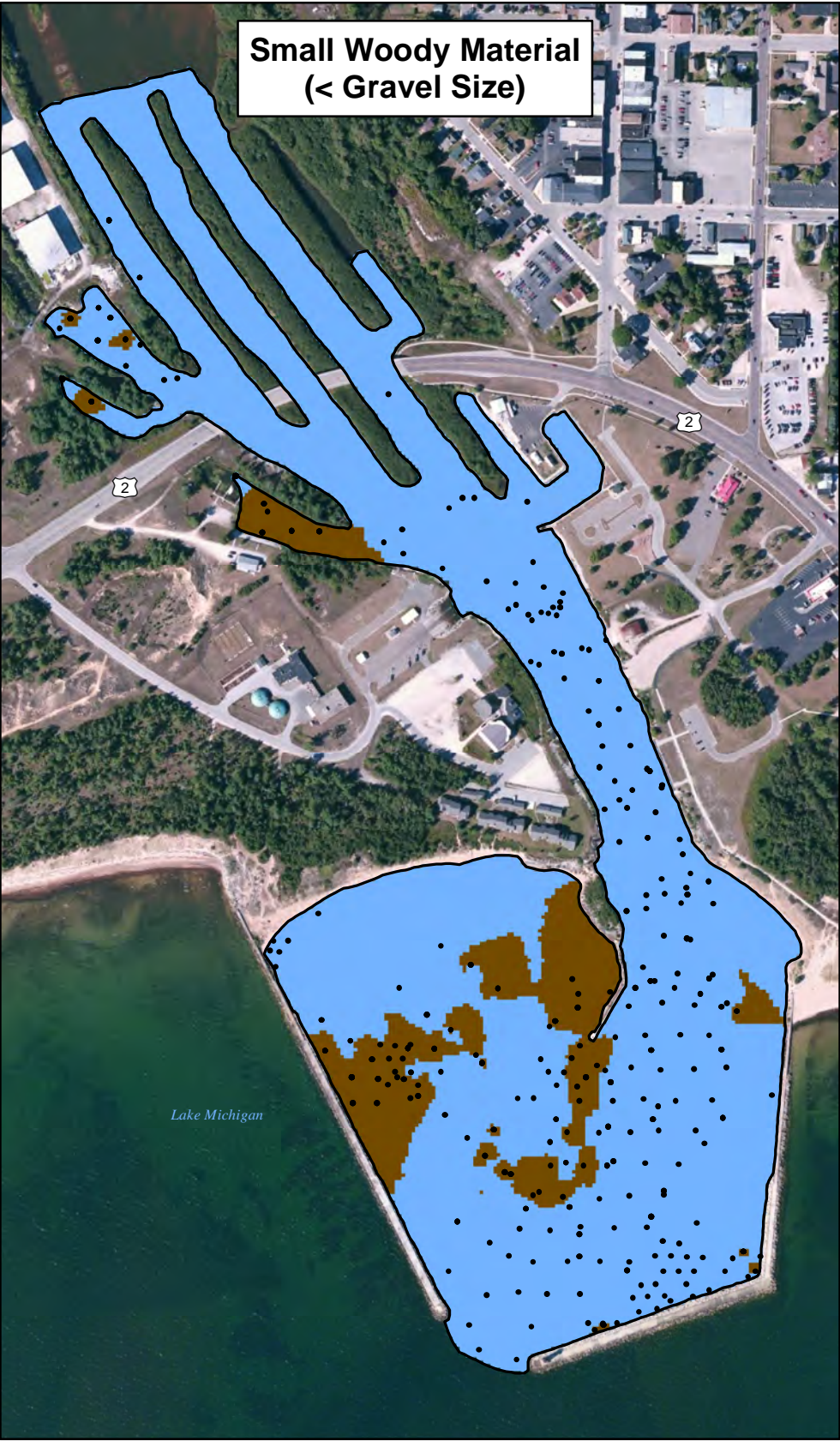
Direction of movement: Right to Left



APPENDIX E

Woody Debris Mapping





NOTES:
1. Data supplied by EA Engineering and NOAA.
2. Base imagery from esri.com, courtesy of esri and its data suppliers.
3. Horizontal coordinates based on NAD1983 Michigan State Plane North (Feet).
4. Model utilizes woody and organic material descriptions in sample logs collected during the 2008, 2011 and 2012 sampling events. The indicated spatial extent represents a modeled probability of greater than 50% of observing the material, based on sample log results.

LEGEND

●

Sediment Sample/Core Log Location

Model Coverage

Predicted Absence of Woody/Organic Material

Predicted Presence of Woody/Organic Material

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.

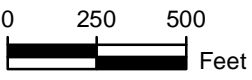


FIGURE 4-21		
WOOD AND ORGANICS SPATIAL EXTENT - PLAN VIEW MANISTIQUE RIVER, MICHIGAN		
Date: MARCH 2013	Revision Date:	
Drawn By: DAT	Checked By: SGL	Scope: 12E009

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